PREPARE BASIC SYSTEM
(REV. B)

BINARY TAPE	20392-60002
SOURCE TAPES	20392-80012 20392-80013 20392-80014
SOURCE LISTING	20392-90002

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0001                ASMB,A,B,L      PREPARE BASIC SYSTEM--JULY 1, 1972
** NO ERRORS*
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0001                    ASMB,A,B,L     PREPARE BASIC SYSTEM--JULY 1, 1972
0003  00002                 ORG  2     20392-90002B
0004*
0005*  THIS PROGRAM WILL CONFIGURE AND PUNCH AS AN ABSOLUTE TAPE THE
0006*  HP BASIC SYSTEM COMPATIBLE WITH 'BOSS'; INCLUSION OF THE 'BOSS'
0007*  VERSION OF THE BASIC INTERPRETER IS OPTIONAL.  TELETYPE,
0008*  PHOTOREADER, AND PUNCH DRIVERS ARE SUPPLIED BY THIS PROGRAM.
0009*  CUSTOM 'CALL' ROUTINES MAY BE INCLUDED IF THE BASIC INTERPRETER
0010*  IS PRESENT.  OPTIONS INCLUDE CHOICE OF BUFFERED OR SERIAL
0011*  TELETYPE AND CONFIGURATION FOR 8, 12, 16, 20, 24, 28, OR 32K OF
0012*  MEMORY.
0013*
0014*  THE AREAS PUNCHED ARE 4 THROUGH 'CONTENTS OF FWAM' -1 AND
0015*  'CONTENTS OF LWAM' +1 THROUGH 'CONTENTS OF LWM'; I.E., SYSTEM
0016*  CODE AND DRIVER CODE.
0017*
0018*  TO OPERATE -
0019*
0020*    1) LOAD THE PBS TAPE WITH THE PROTECTED LOADER.
0021*    2) (OPTIONAL) LOAD BASIC INTERPRETER ('CALL ROUTINES
0022*        MAY ALSO BE LOADED IF DESIRED).
0023*    3) 'LOAD ADDRESS' 2 AND 'PRESET'.
0024*    4) SET SELECT CODE OF TELETYPE (IN OCTAL) INTO THE
0025*        SWITCH REGISTER.  SET SWITCH 15 TO 1 IF USING A
0026*        SERIAL TELETYPE BOARD.
0027*    5) SET TELETYPE TO 'LINE,' TURN ON HIGH-SPEED TAPE PUNCH
0028*        IF PRESENT, AND PRESS 'RUN'.
0029*    6) ANSWER TELETYPE REQUESTS APPROPRIATELY.
0030*    7) AFTER THE HLT 77B, PRESS 'RUN' FOR EXTRA COPIES.
0031*
0032                        SUP       SUPPRESS LISTING OF MULTIPLE OPERANDS
0033*
0034  00002 124003          JMP 3,I       BEGIN
0035  00003 016314          DEF START       EXECUTION
0036*
0037  00004 103004          HLT 4,C       IN CASE OF POWER FAIL
0038  00005 102005          HLT 5         IN CASE OF PARITY FAULT
0039  00006 000000          OCT 0,0,0,0,0,0,0,0,0   NOP ALL
0040  00017 000000          OCT 0,0,0,0,0,0,0,0,0     INTERRUPT LOCATIONS
0041  00030 000000          OCT 0,0,0,0,0,0,0,0,0
0042  00041 000000          OCT 0,0,0,0,0,0,0,0,0
0043  00052 000000          OCT 0,0,0,0
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0045  16314                ORG 16314B
0046*
0047  16314 107700  START  CLC 0,C          TURN OFF INTERRUPT, ALL DEVICES
0048  16315 102501         LIA 1            LOAD FROM SWITCH REGISTER
0049  16316 001623         ELA,RAR          PUT A(15) INTO (E)
0050  16317 013215         AND B77          MASK TO 6 BITS
0051  16320 073244         STA IOADR        SAVE I/O ADDRESS
0052  16321 001121         ARS,ARS          SHIFT OUT FIRST OCTAL DIGIT
0053  16322 001100         ARS
0054  16323 002002         SZA              IS I/O ADDRESS GT 7
0055  16324 026327         JMP GOMAN        YES THEN OK
0056*
0057  16325 102055         HLT 55B          INVALID TTY ADDRESS HALT
0058  16326 026315         JMP START+1      TRY AGAIN
0059*
0060*  SET TELETYPE I/O INSTRUCTION ADDRESSES
0061*
0062  16327 002040  GOMAN  SEZ              BUFFERED TELETYPE?
0063  16330 127240         JMP SERLA,I      NO
0064  16331 063202         LDA M24          YES, LOAD # OF INSTRUCTIONS
0065  16332 067301         LDB LST1A        ADDRESS OF INSTRUCTION LIST
0066  16333 016640         JSB SETI         SET TTY I/O ADDRESSES
0067*
0068*  CALL FOR PHOTOREADER ADDRESS INPUT
0069*
0070  16334 016634  PHRDR  JSB CRLFD        DO A CR/LF
0071  16335 063200         LDA M27          MESSAGE LENGTH, NEGATIVE NO CRLF
0072  16336 067050         LDB MA1          MESSAGE ADDRESS
0073  16337 016563         JSB GETAD        GET ADDRESS
0074  16340 026352         JMP NORDR        ADDRESS =0, NO READER
0075  16341 063206         LDA M5           VALID READER ADDRESS
0076  16342 067310         LDB LST2A        READER INSTRUCTION ADDRESS LIST
0077  16343 016640         JSB SETI         SET READER I/O INSTRUCTIONS
0078  16344 063307         LDA RO           SET CLC RDR
0079  16345 073524  PHRD1  STA R,OFF          INSTRUCTION
0080  16346 063247         LDA LWAMR
0081  16347 070111         STA LWAM         SET LAST WORD AVAILABLE MEMORY
0082  16350 002004         INA
0083  16351 070101         STA 101B         SET READER LINK
0084*
0085*    CALL FOR PUNCH ADDRESS INPUT
0086*
0087  16352 016634  NORDR  JSB CRLFD
0088  16353 063203         LDA M20
0089  16354 067067         LDB MA2
0090  16355 016563         JSB GETAD        CALL FOR PUNCH ADDRESS INPUT.
0091  16356 026370         JMP SYSDP        NO PUNCH
0092  16357 063206         LDA M5           VALID PUNCH ADDRESS
0093  16360 067317         LDB LST3A        PUNCH INSTRUCTION ADDRESS LIST
0094  16361 016640         JSB SETI         SET PUNCH I/O INSTRUCTIONS
0095  16362 063316         LDA PO           SET CLC PNCH
0096  16363 073525  NORD1  STA P,OFF          INSTRUCTION
0097  16364 063250         LDA LWAMP
0098  16365 070111         STA LWAM         SET LWAM
0099  16366 002004         INA
0100  16367 070103         STA 103B         SET PUNCH LINK
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0101*
0102*  CALL FOR DUMP DEVICE ADDRESS
0103*
0104   16370 016634  SYSDP JSB CRLFD      CR/LF
0105   16371 063201        LDA M25
0106   16372 067135        LDB MA5
0107   16373 016563        JSB GETAD      GET DUMP I/O ADDRESS
0108   16374 026402        JMP CORAD      NO SYSTEM DUMP DEVICE AVAILABLE
0109   16375 063207        LDA CM,4       SYSTEM DUMP DEVICE AVAILABLE
0110   16376 067324        LDB LST4A      SET DEVICE'S I/O INSTRUCTIONS
0111   16377 016640        JSB SETI
0112   16400 063246        LDA PNCHI      SET PUNCH OUTPUT TO REFERENCE
0113   16401 073245        STA PNCHO        HIGH SPEED PUNCH ROUTINE
0114*
0115*  CALL FOR CORE SIZE
0116*
0117   16402 016634  CORAD JSB CRLFD
0118   16403 063205        LDA M12        REQUEST
0119   16404 067153        LDB MA6
0120   16405 017445  CORA1 JSB TTY,P        CORE
0121   16406 063213        LDA ,20
0122   16407 067002        LDB BUF            SIZE
0123   16410 000000  CORA2 NOP
0124   16411 017426        JSB TTY,I
0125   16412 000000        NOP
0126   16413 002003        SZA,RSS        NULL ANSWER?
0127   16414 026524        JMP DUMP       YES, ASSUME 8K
0128   16415 163002        LDA BUF,I      NO
0129   16416 053221        CPA C8K        '8 NULL'?
0130   16417 026524        JMP DUMP       YES
0131   16420 006400        CLB            NO
0132   16421 053222        CPA C12K       '12'?
0133   16422 026447        JMP RELOC      YES
0134   16423 006004        INB            NO
0135   16424 053223        CPA C16K       '16'?
0136   16425 026447        JMP RELOC      YES
0137   16426 006004        INB            NO
0138   16427 053224        CPA C20K       '20'?
0139   16430 026447        JMP RELOC      YES
0140   16431 006004        INB            NO
0141   16432 053225        CPA C24K       '24'?
0142   16433 026447        JMP RELOC      YES
0143   16434 006004        INB            NO
0144   16435 053226        CPA C28K       '28'?
0145   16436 026447        JMP RELOC      YES
0146   16437 006004        INB            NO
0147   16440 053227        CPA C32K       '32'?
0148   16441 026447        JMP RELOC      YES
0149   16442 016634        JSB CRLFD      NO
0150   16443 063204        LDA M15
0151   16444 067162        LDB MA7        PRINT
0152   16445 017445  CORA3 JSB TTY,P        ERROR
0153   16446 026402        JMP CORAD      TRY AGAIN
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0155*
0156*  RELOCATE DRIVERS
0157*
0158   16447 047230  RELOC ADB INCIN      LOAD
0159   16450 164001       LDB 1,I          DISPLACEMENT
0160   16451 063237       LDA LWM          ADJUST
0161   16452 040001       ADA 1
0162   16453 073237       STA LWM            ABSOLUTE
0163   16454 063672       LDA CRLFA
0164   16455 040001       ADA 1                POINTERS
0165   16456 073672       STA CRLFA
0166   16457 060101       LDA 101B
0167   16460 040001       ADA 1
0168   16461 002021       SSA,RSS
0169   16462 070101       STA 101B
0170   16463 060102       LDA 102B
0171   16464 040001       ADA 1
0172   16465 070102       STA 102B
0173   16466 060103       LDA 103B
0174   16467 040001       ADA 1
0175   16470 002021       SSA,RSS
0176   16471 070103       STA 103B
0177   16472 060104       LDA 104B
0178   16473 040001       ADA 1
0179   16474 070104       STA 104B
0180   16475 060111       LDA LWAM
0181   16476 073241       STA SOURC      SAVE ADDRESS OF DRIVER MODULE
0182   16477 040001       ADA 1
0183   16500 070111       STA LWAM
0184   16501 073242       STA DEST       SET DESTINATION ADDRESS
0185   16502 060123       LDA IMOFF
0186   16503 040001       ADA 1
0187   16504 070123       STA IMOFF
0188   16505 060124       LDA IMON
0189   16506 040001       ADA 1
0190   16507 070124       STA IMON
0191   16510 060125       LDA TLINK
0192   16511 040001       ADA 1
0193   16512 070125       STA TLINK
0194   16513 067237       LDB LWM        COMPUTE
0195   16514 007004       CMB,INB          # OF WORDS
0196   16515 044111       ADB LWAM           TO BE MOVED
0197   16516 037241  MOREM ISZ SOURC      ADVANCE
0198   16517 037242       ISZ DEST         POINTERS
0199   16520 163241       LDA SOURC,I    MOVE A
0200   16521 173242       STA DEST,I       WORD
0201   16522 006006       INB,SZB        DONE?
0202   16523 026516       JMP MOREM      NO
```

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0204*
0205*       THIS SECTION DUMPS THE ELEMENTS OF THE SYSTEM LOADED
0206*
0207   16524 016634  DUMP   JSB CRLFD
0208   16525 060111         LDA LWAM       SET STARTING
0209   16526 043176         ADA M36          ADDRESS FOR
0210   16527 070131         STA IOBFA          I/O BUFFER
0211   16530 070117         STA SYMTA      SET SYMBOL TABLE POINTER
0212   16531 043175         ADA M97        SET STARTING ADDRESS
0213   16532 070134         STA SBUFA        FOR SYNTAX BUFFER
0214   16533 043210         ADA M1
0215   16534 070111         STA LWAM       SAVE VALUE CORRECTED FOR BUFFERS
0216   16535 070106         STA LWBM       FOR STAND-ALONE OPERATION
0217   16536 063245         LDA PNCHO
0218   16537 053246         CPA PNCHI      SYSTEM DUMP DEVICE AVAILABLE?
0219   16540 026547         JMP COPY       PUNCH IS AVAILABLE
0220*
0221   16541 063214         LDA .30
0222   16542 067102         LDB MA3
0223   16543 017445  DUMP1  JSB TTY.P      REQUEST TTY PUNCH ON
0224*
0225   16544 060126  DUMP2  LDA PLSTR      PREPARE TO
0226   16545 070127         STA LISTR        PUNCH
0227   16546 102011         HLT 11B
0228*
0229   16547 016776  COPY   JSB LTG        GENERATE LEADER
0230   16550 063212         LDA .4         DUMP
0231   16551 007400         CCB              LOCATIONS 4
0232   16552 044110         ADB FWAM           THROUGH
0233   16553 016726         JSB PNCHA            (FWAM)-1
0234   16554 060111         LDA LWAM       DUMP
0235   16555 043216         ADA .135         DRIVER
0236   16556 067237         LDB LWM            AREA
0237   16557 016726         JSB PNCHA
0238   16560 016776         JSB LTG        GENERATE TRAILER
0239   16561 102077         HLT 77B        END OF DUMP ROUTINE
0240   16562 026547         JMP COPY       GO MAKE ANOTHER COPY
```

```
0242*
0243*  SUBROUTINE GETAD
0244*
0245*     THIS SUBROUTINE CALLS FOR I/O ADDRESS INPUT, PROCESSES THE
0246*      INPUT AND IF INPUT VALID RETURNS TO P+2. IF NOTHING IS
0247*      INPUTTED IT RETURNS TO P+1 WITH LINK TO STOP IN A
0248*
0249*     CALL:     JSB  GETAD
0250*                (A) =  LENGTH OF MESSAGE ASKING FOR I/O ADDRESS
0251*                (B) =  ADDRESS OF MESSAGE
0252*
0253*     RETURN:     ZERO   INPUT  =  P+1      (A) = LINK TO STOP
0254*                 VALID ADDRESS =  P+2      (A) = I/O ADDRESS
0255*
0256*                 I/O ADDRESS IS SAVED IN LOCATION IOADR
0257*
0258*     IF INPUT IS INVALID (IE NOT TWO NUMBERS 10-77)
0259*          "INVALID I/O ADDRESS" IS TYPED AND IT WAITS
0260*          FOR FURTHER INPUT.
0261*
0262  16563 000000  GETAD NOP
0263  16564 017445       JSB TTY,P      PRINT INPUT REQUESTESSAGE
0264  16565 063213 INPUT LDA .20
0265  16566 067002       LDB BUF
0266  16567 000000 GETA1 NOP            WAIT
0267  16570 017426       JSB TTY,I        FOR
0268  16571 000000       NOP                INPUT
0269  16572 002003       SZA,RSS        ANY ADDRESS?
0270  16573 126563       JMP GETAD,I    NO ADDRESS
0271  16574 053656       CPA .2         TWO CHARACTERS INPUT?
0272  16575 026604       JMP TWOCH      TWO CHARACTERS INPUTTED
0273*
0274  16576 016634 ERRO. JSB CRLFD      INVALID INPUT ERROR
0275  16577 063213       LDA .20
0276  16600 067122       LDB MA4
0277  16601 017445 GETA2 JSB TTY,P      PRINT 'INVALID INPUT'
0278  16602 016634       JSB CRLFD      DO A RETURN AND LINE FEED
0279  16603 026565       JMP INPUT      RETURN FOR MORE INPUT
0280*
0281  16604 163002 TWOCH LDA BUF,I      GET FIRST TWO CHARACTERS
0282  16605 001727       ALF,ALF        LOOK AT FIRST CHARACTER
0283  16606 016623       JSB NBER       CHECK FOR VALID OCTAL;YES,CONVRT
0284  16607 026576       JMP ERRO.      NOT OCTAL
0285  16610 002003       SZA,RSS        ADDRESS > 7 ?
0286  16611 026576       JMP ERRO.      NO
0287  16612 001723       ALF,RAR        MOVE FIRST DIGIT 3 BITS LEFT
0288  16613 073244       STA IOADR        AND SAVE
0289  16614 163002       LDA BUF,I
0290  16615 016623       JSB NBER       CHECK SECOND CHARACTER
0291  16616 026576       JMP ERRO.      NOT OCTAL
0292  16617 033244       IOR IOADR      FORM TWO DIGIT OCTAL NUMBER
0293  16620 073244       STA IOADR      SAVE I/O ADDRESS
0294  16621 036563       ISZ GETAD      NON-ZERO I/O ADDRESS
0295  16622 126563       JMP GETAD,I    RETURN
```

```
0297*
0298*  SUBROUTINE NBER
0299*
0300*   THIS SUBROUTINE CHECKS WHETHER THE CHARACTER IN A REPRESENTS
0301*    A VALID OCTAL DIGIT. IF THE CHARACTER IS VALID IT IS
0302*      CONVERTED TO AN OCTAL DIGIT.
0303*
0304*   RETURN:     P+1  INVALID OCTAL CHARACTER
0305*               P+2  VALID OCTAL CHARACTER
0306*                      (A) = OCTAL DIGIT
0307*
0308*
0309  16623 000000  NBER  NOP
0310  16624 013666        AND B177       MASK TO ONE CHARACTER
0311  16625 043177        ADA N60        SUBTRACT OCTAL 60
0312  16626 070001        STA 1          TRANSFER TO B
0313  16627 005121        BRS,BRS
0314  16630 005100        BRS            SHIFT OUT FIRST 3 BITS
0315  16631 006003        SZB,RSS        IS B ZERO
0316  16632 036623        ISZ NBER       B=0, VALID DIGIT, RETURN TO P+2
0317  16633 126623        JMP NBER,I     RETURN



0319*
0320*   SUBROUTINE CRLFD OUTPUTS A CARRIAGE RETURN AND LINE FEED.
0321*
0322  16634 000000  CRLFD NOP            EXIT/ENTRY
0323  16635 002400        CLA
0324  16636 017445  CRLF1 JSB TTY,P      DO CR/LF
0325  16637 126634        JMP CRLFD,I    EXIT
```

```
0327*
0328*  SUBROUTINE SETI
0329*
0330*   THIS SUBROUTINE MODIFIES THE ADDRESSES SPECIFIED IN A LIST
0331*
0332*   CALL:    JSB SETI
0333*                (A) = NUMBER OF LOCATIONS TO BE MODIFIED (2'S COMP)
0334*                (B) = STARTING ADDRESS OF LIST OF ADDRESSES
0335*
0336*
0337   16640 000000  SETI  NOP             EXIT/ENTRY
0338   16641 073676        STA COUNT       SAVE LENGTH OF LIST
0339   16642 077675        STB BADDR       SET LIST STARTING ADDRESS
0340   16643 167675  LOOP  LDB BADDR,I     LOAD ADDRESS OF INSTRUCTION
0341   16644 160001        LDA 1,I         LOAD INSTRUCTION TO BE MODIFIED
0342   16645 013173        AND MASK        ZERO I/O PART, MASK=177700
0343   16646 033244        IOR IOADR       INSERT I/O ADDRESS
0344   16647 170001        STA 1,I         SET MODIFIED INSTRUCTION
0345   16650 037675        ISZ BADDR       INDEX LIST POINTER
0346   16651 037676        ISZ COUNT
0347   16652 026643        JMP LOOP        GO DO NEXT LOCATION
0348   16653 126640        JMP SETI,I      RETURN




0350*
0351* SUBROUTINE (TOUT) TO OUTPUT ONE CHARACTER
0352* TO TELETYPE.  CHARACTER IS IN (A).  (B) IS NOT ALTERED.
0353*
0354   16654 000000  TOUT  NOP
0355   16655 102600  TP.11 OTA TTY         LOAD BOARD BUFFER
0356   16656 103700        STC TTY,C       GIVE PUNCH COMMAND
0357   16657 102300        SFS TTY         WAIT FOR
0358   16660 026657        JMP *-1           COMPLETION
0359   16661 126654        JMP TOUT,I




0361*
0362*  SUBROUTINE  (POUT) TO OUTPUT ONE CHARACTER TO
0363*  PUNCH DEVICE.  CHARACTER IS IN (A).  (B) IS NOT ALTERED.
0364*
0365   16662 000000  POUT  NOP
0366   16663 102600        OTA PNCH        FILL BOARD BUFFER
0367   16664 103700        STC PNCH,C      REQUEST PUNCH
0368   16665 102300        SFS PNCH        WAIT UNTIL
0369   16666 026665        JMP *-1           DONE
0370   16667 126662        JMP POUT,I
```

```
0372*
0373*   SUBROUTUNE PUNCH
0374*
0375*   THIS SUBROUTINE PROVIDES THE MEANS OF PUNCHING BINARY
0376*      RECORDS ON THE TELETYPE OR HIGH SPEED PUNCH.
0377*
0378*    CALLING SEQUENCE   JSB PUNCH
0379*
0380*      (A) = LENGTH (AND MODE) OF RECORD TO BE OUTPUT
0381*      (B) = STARTING ADDRESS OF DATA BUFFER
0382*
0383*  BINARY OUTPUT IS INDICATED BY A NEGATIVE (2S COMPLE-
0384*   MENT) VALUE IN A.  THIS NEGATIVE VALUE IS THE
0385*   NUMBER OF WORDS TO BE OUTPUT.
0386*
0387*   IF A = 0 ON ENTRY 10 INCHES OF FEED FRAMES ARE PUNCHED
0388*
0389   16670 000000  PUNCH NOP            EXIT/ENTRY
0390   16671 077042        STB BUFF       SAVE STARTING ADDRESS OF BUFFER
0391   16672 067515        LDB PMODE
0392   16673 106600  TP.9   OTB TTY       SET TTY TO PUNCH MODE
0393   16674 002002        SZA            CHECK FOR FEED FRAMES ONLY
0394   16675 026700        JMP *+3        NOT FEED FRAME MODE
0395   16676 063174        LDA .200
0396   16677 026716        JMP PP03+1     DO FEED FRAMES ONLY
0397*
0398   16700 001000        ALS            CONVERT COUNT TO CHARACTERS (X2)
0399   16701 073243        STA CHC1       AS COUNTER FOR OUTPUT SECTION.
0400   16702 067220        LDB UL52       SET UPPER/LOWER INDICATOR
0401*
0402* CHARACTER OUTPUT SECTION
0403*
0404   16703 163042  PP02  LDA BUFF,I     GET WORD CONTAINING CHARACTER
0405   16704 006021        SSB,RSS        IF UPPER/LOWER FLAG SAYS UPPER
0406   16705 001727        ALF,ALF         (SIGN = 0) ROTATE TO LOWER
0407   16706 013217        AND M377       REMOVE UPPER CHARACTER
0408   16707 117245        JSB PNCHO,I    OUTPUT CHARACTER
0409   16710 006020        SSB            IF CHAR. OUTPUT WAS LOWER CHAR.,
0410   16711 037042        ISZ BUFF        ADD 1 TO BUFFER ADDRESS.
0411   16712 005200        RBL            SET UPPER/LOWER FLAG FOR NEXT CHA
0412   16713 037243        ISZ CHC1       INDEX CHARACTER COUNTER.
0413   16714 026703        JMP PP02        NOT ZERO, MORE TO OUTPUT.
0414*
0415*  COMPLETION SECTION
0416*
0417   16715 063207  PP03  LDA CM.4       BINARY SECTION.  SET BUFF = -4
0418   16716 073042        STA BUFF        FOR COUNTER FOR FEED-FRAMES
0419   16717 002400        CLA            SET A = ZERO( FEED-FRAME).
0420   16720 117245        JSB PNCHO,I    OUTPUT FEED FRAME
0421   16721 037042        ISZ BUFF       INDEX COUNTER
0422   16722 026717        JMP *-3         CONTINUE OUTPUT
0423   16723 106700  TP.10 CLC TTY        TURN OFF TTY
0424   16724 106700  PN8   CLC PNCH       TURN OFF PUNCH
0425   16725 126670        JMP PUNCH,I    EXIT
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0427*
0428* SUBROUTINE= PNCHA  (PUNCH ABSOLUTE BLOCK)
0429*
0430*  UPON ENTRY =-
0431*    (A) = ADDRESS OF FIRST WORD OF BLOCK
0432*    (B) = ADDRESS OF LAST WORD OF BLOCK
0433*
0434  16726 000000  PNCHA NOP
0435  16727 006004        INB           SET = TO LAST +1M FOR EOB CHECK
0436  16730 073043        STA T1        SAVE FIRST AND LAST WORD
0437  16731 077044        STB T2         ADDRESSES OF BLOCK.
0438  16732 063200  P1    LDA M27       SET T3 = -27 AS INDEX FOR
0439  16733 073045        STA T3         FILLING BUFFER.
0440  16734 063043        LDA T1       SET BUF+1 FOR LOAD ADDRESS
0441  16735 173003        STA BUF1,I     OF CURRENT BLOCK.
0442  16736 073047        STA CKSUM     INITIALIZE CHECKSUM WORD.
0443  16737 002400        CLA           INITIALIZE
0444  16740 173002        STA BUF,I      WORD COUNT
0445  16741 063002        LDA BUF       SET T4 = ADDRESS
0446  16742 043656        ADA .2         OF WORD 3 OF BUFFER
0447  16743 073046        STA T4          FOR STORING WORDS.
0448*
0449  16744 163043  P2    LDA T1,I      STORE CURRENT WORD FORM MEMORY
0450  16745 173046        STA T4,I       BLOCK IN BUFFER.
0451  16746 037043        ISZ T1         BUMP BLOCK ADDRESS
0452  16747 037046        ISZ T4        ADD 1 TO BUFFER ADD95073
0453  16750 043047        ADA CKSUM     ADD WORD TO CUMULATED
0454  16751 073047        STA CKSUM      CHECKSUM
0455  16752 137002        ISZ BUF,I     COUNT WORD STORED IN BUFFER.
0456  16753 063043        LDA T1        CHECK FOR END OF BLOCK.
0457  16754 053044        CPA T2
0458  16755 026760        JMP P3        YES, FWA = LWA.
0459  16756 037045        ISZ T3        INDEX BUFFER COUNTER.
0460  16757 026744        JMP P2        BUFFER NOT YET FILLED.
0461*
0462  16760 063047  P3    LDA CKSUM     BUFFER FILLED. SET CHECKSUM IN
0463  16761 173046        STA T4,I      LAST WORD IN BUFFER.
0464  16762 163002        LDA BUF,I     POSITION RECORD
0465  16763 001727        ALF,ALF        WORD COUNT TO
0466  16764 173002        STA BUF,I       UPPER CHARACTER IN WORD 1.
0467  16765 001727        ALF,ALF       REPOSITION, ADD 3 FOR
0468  16766 043211        ADA C.03       TOTAL RECORD LENGTH, SET
0469  16767 003004        CMA,INA         NEGATIVE FOR OUTPUT.
0470  16770 067002        LDB BUF        (B) = ADDR. OF BUFFER.
0471  16771 016670        JSB PUNCH      PUNCH RECORD
0472*
0473  16772 063043        LDA T1        CHECK AGAIN FOR COMPLETION OF
0474  16773 053044        CPA T2         PUNCHING BLOCK.
0475  16774 126726        JMP PNCHA,I    YES, EXIT.
0476  16775 026732        JMP P1         NO, SET NEXT RECORD.
```

```
0478*
0479* SUBROUTINE: LTG  (LEADER/TRAILER GENERATOR)
0480*
0481*
0482*  LTG PRODUCES APPROXIMATELY 10-INCHES
0483*    OF BLANK TAPE (FEED-FRAME
0484*
0485  16776 000000  LTG   NOP
0486  16777 002400        CLA             SET FEED FRAME MODE A=0
0487  17000 016670        JSB PUNCH       PUNCH FEED FRAMES
0488  17001 126776        JMP LTG,I       EXIT.




0490*
0491* PUNCH BUFFER
0492*
0493  17002 017004  BUF   DEF BUFFR
0494  17003 017005  BUF1  DEF BUFFR+1
0495*
0496  17004 000000  BUFFR BSS 30
0497  17042 000000  BUFF  NOP
0498  17043 000000  T1    NOP
0499  17044 000000  T2    NOP
0500  17045 000000  T3    NOP
0501  17046 000000  T4    NOP
0502  17047 000000  CKSUM NOP




0504*
0505*    MESSAGE STORAGE SECTION
0506*
0507  17050 017051  MA1   DEF MSG1
0508  17051 020120  MSG1  ASC 14, PHOTO READER I/O ADDRESS?
0509  17067 017070  MA2   DEF MSG2
0510  17070 020120  MSG2  ASC 10, PUNCH I/O ADDRESS?
0511  17102 017103  MA3   DEF MSG3
0512  17103 020124  MSG3  ASC 15, TURN ON TTY PUNCH, PRESS RUN
0513  17122 017123  MA4   DEF MSG4
0514  17123 020111  MSG4  ASC 10, INVALID I/O ADDRESS
0515  17135 017136  MA5   DEF MSG5
0516  17136 020123  MSG5  ASC 13, SYSTEM DUMP I/O ADDRESS?
0517  17153 017154  MA6   DEF MSG6
0518  17154 020103  MSG6  ASC 6, CORE SIZE?
0519  17162 017163  MA7   DEF MSG7
0520  17163 020111  MSG7  ASC 8, IMPROPER INPUT
```

```
0522*
0523*  CONSTANT AND DATA SECTION
0524*
0525  17173 177700  MASK  OCT 177700
0526  17174 177470  .200  DEC -200
0527  17175 177637  M97   DEC -97
0528  17176 177734  M36   DEC -36
0529  17177 177720  N60   OCT -60
0530  17200 177745  M27   DEC -27
0531  17201 177747  M25   DEC -25
0532  17202 177750  M24   DEC -24
0533  17203 177754  M20   DEC -20
0534  17204 177761  M15   DEC -15
0535  17205 177764  M12   DEC -12
0536  17206 177773  M5    DEC -5
0537  17207 177774  CM.4  DEC -4
0538  17210 177777  M1    DEC -1
0539  17211 000003  C.03  DEC 3
0540  17212 000004  .4    DEC 4
0541  17213 000024  .20   DEC 20
0542  17214 000036  .30   DEC 30
0543  17215 000077  B77   OCT 77
0544  17216 000207  .135  DEC 135
0545  17217 000377  M377  OCT 377
0546  17220 052525  UL52  OCT 52525
0547*
0548  17221 034000  C8K   OCT 34000      ACCEPTABLE
0549  17222 030462  C12K  OCT 30462
0550  17223 030466  C16K  OCT 30466        CORE
0551  17224 031060  C20K  OCT 31060
0552  17225 031064  C24K  OCT 31064          SIZE
0553  17226 031070  C28K  OCT 31070
0554  17227 031462  C32K  OCT 31462            ANSWERS
0555*
0556  17230 017231  INCIN DEF *+1
0557  17231 010000        OCT 10000
0558  17232 020000        OCT 20000      RELOCATION
0559  17233 030000        OCT 30000
0560  17234 040000        OCT 40000
0561  17235 050000        OCT 50000
0562  17236 060000        OCT 60000        INCREMENTS
0563*
0564  17237 017677  LWM   DEF EOTC       LAST WORD AVAILABLE
0565  17240 015073  SERLA DEF SRIAL
0566*
0567  17241 000000  SOURC NOP
0568  17242 000000  DEST  NOP
0569  17243 000000  CHC1  NOP
0570  17244 000000  IOADR NOP
0571*
0572  17245 016654  PNCHO DEF TOUT       PUNCH LINK LOCATION
0573  17246 016662  PNCHI DEF POUT       PUNCH REFERENCE INSTRUCTION
0574*
0575  17247 017367  LWAMR DEF .HSPR-1    LWAM IF PHOTO READER
0576  17250 017346  LWAMP DEF .PNCH-1    LWAM IF PUNCH
```

```
0578*
0579*  LIST OF INSTRUCTIONS (ADDRESSES) TO BE SET
0580*
0581*
0582*   TELETYPE INSTRUCTIONS ADDRESS LIST
0583*
0584   17251 017433  LIST1 DEF TI.1
0585   17252 017434        DEF TI.2
0586   17253 017435        DEF TI.2+1
0587   17254 017437        DEF TI.3
0588   17255 017442        DEF TI.4
0589   17256 017522        DEF TI.5
0590   17257 017523        DEF TI.5+1
0591   17260 017531        DEF TI.6
0592   17261 017533        DEF TI.7
0593   17262 017534        DEF TI.7+1
0594   17263 017447        DEF TP.1
0595   17264 017456        DEF TP.2-1
0596   17265 017457        DEF TP.2
0597   17266 017462        DEF TP.4
0598   17267 017463        DEF TP.4+1
0599   17270 017464        DEF TP.5
0600   17271 017471        DEF TP.6
0601   17272 017500        DEF TP.7
0602   17273 017502        DEF TP.8
0603   17274 016673        DEF TP.9
0604   17275 016723        DEF TP.10
0605   17276 016655        DEF TP.11
0606   17277 016656        DEF TP.11+1
0607   17300 016657        DEF TP.11+2
0608*
0609   17301 017251  LST1A DEF LIST1
0610*
0611*  PHOTO READER INSTRUCTIONS ADDRESS LIST
0612*
0613   17302 017407  LIST2 DEF PR3
0614   17303 017413        DEF PR5
0615   17304 017415        DEF PR6
0616   17305 017422        DEF PR7
0617   17306 017307        DEF RO
0618*
0619   17307 106700  RO    CLC RDR
0620   17310 017302  LST2A DEF LIST2
0621*
0622*  HIGH SPEED PUNCH INSTRUCTIONS ADDRESS LIST
0623*
0624   17311 017353  LIST3 DEF PN3
0625   17312 017354        DEF PN4
0626   17313 017355        DEF PN5
0627   17314 017362        DEF PN7
0628   17315 017316        DEF PO
0629*
0630   17316 106700  PO    CLC PNCH
0631   17317 017311  LST3A DEF LIST3
```

```
0633*
0634*  SYSTEM DUMP INSTRUCTIONS ADDRESS LIST
0635*
0636   17320 016724  LIST4 DEF PNB
0637   17321 016663         DEF POUT+1
0638   17322 016664         DEF POUT+2
0639   17323 016665         DEF POUT+3
0640*
0641   17324 017320  LST4A DEF LIST4



0643*
0644*  SKIP DIFFERENCE IN WORDS BETWEEN PARALLEL AND
0645*  SERIAL TELETYPE PACKAGES.
0646*
0647   17325 000000         BSS 22B        (STOPI-SPNCH)-(TT.II-.PNCH)
```

```
0002*
0003*************** BASIC SYSTEM HIGH SPEED PUNCH DRIVER ****************
0004*
0005*  OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0006*
0007*  CALL:  JSB 1038,I
0008*
0009*         (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0010*         (B) = STARTING ADDRESS OF BUFFER
0011*
0012*
0013*      IF (A) IS >= 0  THEN OUTPUT (A) CHARACTERS
0014*      FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0015*
0016*      IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0017*
0018*      BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0019*
0020*      IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0021*      IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0022*
0023*
0024  17347 000000  .PNCH NOP
0025  17350 017636  PN1   JSB INIT       INITIALIZE FOR PUNCHING
0026  17351 017622  PN2   JSB GETCH      GET NEXT CHARACTER FROM BUFFER
0027  17352 027360        JMP PN6        BUFFER EMPTY
0028  17353 102600  PN3   OTA PNCH       LOAD PUNCH BUFFER
0029  17354 103700  PN4   STC PNCH,C     GIVE PUNCH COMMAND
0030  17355 102300  PN5   SFS PNCH
0031  17356 027355        JMP *-1        WAIT FOR PUNCH READY
0032  17357 027351        JMP PN2        GET NEXT CHARACTER
0033*
0034  17360 063671  PN6   LDA IORI
0035  17361 073633        STA FINSH+1    RESTORE IOR INSTRUCTION
0036  17362 106700  PN7   CLC PNCH       TURN OFF PUNCH
0037  17363 002141        SEZ,CLE,RSS    RECORD COMPLETE? CLEAR E
0038  17364 127347        JMP .PNCH,I    E=0, OUTPUT COMPLETE
0039  17365 063655        LDA M2         E=1, APPEND CR AND LF
0040  17366 067672        LDB CRLFA      LOAD ADDRESS OF CR AND LF
0041  17367 027350        JMP PN1        DO CR/LF
```

```
0043*
0044*************** BASIC SYSTEM PHOTO READER DRIVER  ******************
0045*
0046*  INPUTS TAPE RECORDS THROUGH THE PHOTO READER
0047*
0048*  CALL:  JSB 101B,I
0049*
0050*         (A) =  MAXIMUM NUMBER CHARS IN RECORD
0051*         (B) =  BUFFER STARTING ADDRESS
0052*
0053*   ON RETURN  (A)= -1  TOO MANY CHARACTERS IN RECORD
0054*              (A)= -2  END OF TAPE DETECTED
0055*              (A)= -3  NO TAPE OR GATE DOWN
0056*              (A)= NUMBER OF CHARACTERS IN RECORD
0057*
0058*           INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
0059*
0060*           ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0061*           THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0062*
0063*           THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0064*
0065*           AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0066*           CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0067*
0068*      IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
0069*      READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
0070*
0071*
0072  17370 000000  .HSPR NOP
0073  17371 073676        STA COUNT     SAVE LENGTH
0074  17372 077674        STB BUFSA     SAVE BUFFER STARTING ADDRESS
0075  17373 063653  PR1   LDA M11
0076  17374 073677        STA EOTC      INITIALIZE EOT COUNTER
0077  17375 067674        LDB BUFSA
0078  17376 077675        STB BADDR     INITIALIZE BUFFER POINTER
0079  17377 006400        CLB           INITIALIZE CHARACTER COUNT
0080  17400 006003  PR2   SZB,RSS       ANY NON-NULL CHARACTERS YET?
0081  17401 002002        SZA           NO, SKIP IF NULL
0082  17402 027407        JMP PR3
0083  17403 037677        ISZ EOTC      COUNT NULL
0084  17404 027407        JMP PR3       NOT YET 10 NULLS
0085  17405 063655        LDA M2        SET A TO INDICATE EOT (=2)
0086  17406 027422        JMP PR7       10 NULLS, TURN OFF READER & EXIT
0087  17407 103700  PR3   STC RDR,C     REQUEST CHARACTER
0088  17410 002400        CLA           SET DELAY COUNT
0089  17411 002007  PR4   INA,SZA,RSS   DELAY = 6.4 * 65K = .41 SECONDS
0090  17412 027424        JMP PR8       (A)=0, NO TAPE OR GATE DOWN
0091  17413 102300  PR5   SFS RDR
0092  17414 027411        JMP PR4       NO FLAG, CHECK DELAY COUNT
0093  17415 103500  PR6   LIA RDR,C     LOAD CHARACTER
0094  17416 017537        JSB PROCS     PROCESS CHARACTER
0095  17417 027400        JMP PR2       GET NEXT CHARACTER
0096  17420 057655        CPB M2        RUBOUT IN THIS RECORD?
0097  17421 027373        JMP PR1       YES, IGNORE RECORD
0098  17422 106700  PR7   CLC RDR       TURN OFF READER
```

```
0099  17423 127370        JMP ,HSPR,I
0100*
0101  17424 063654  PR8    LDA M3          LOAD 'NO TAPE' STATUS
0102  17425 027422         JMP PR7
```

```
0104*
0105*******************  BASIC SYSTEM TELETYPE INPUT DRIVER  *************
0106*
0107*    INPUTS FROM AN ASR 33/35 THROUGH THE
0108*    TELETYPE CONTROL BOARD FROM TAPE OR KEYBOARD.
0109*
0110*     CALL:  JSB 1048,I
0111*
0112*          (A) =  MAXIMUM NUMBER CHARS IN RECORD
0113*          (B) =  BUFFER STARTING ADDRESS
0114*
0115*     RETURN:    (A)= -1  TOO MANY CHARACTERS IN RECORD
0116*                (A)= -2  RECORD DELETED
0117*                (A)= NUMBER OF CHARACTERS IN RECORD
0118*
0119*
0120*             THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0121*
0122*             ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0123*             THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0124*
0125*             THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0126*
0127*             AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0128*             CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0129*
0130*
0131  17426 000000  TTY.I NOP
0132  17427 073676        STA COUNT      SAVE LENGTH
0133  17430 077675        STB BADDR      SET BUFFER ADDRESS
0134  17431 006400        CLB            SET CHARACTER COUNTER
0135  17432 063444        LDA IMODE
0136  17433 102600  TI.1   OTA TTY        SET TTY TO INPUT MODE
0137  17434 103700  TI.2   STC TTY,C      REQUEST CHARACTER
0138  17435 102300        SFS TTY
0139  17436 027435        JMP *-1        WAIT FOR CHARACTER INPUT
0140  17437 102500  TI.3   LIA TTY        LOAD CHARACTER
0141  17440 017537        JSB PROCS      PROCESS CHARACTER
0142  17441 027434        JMP TI.2       GET NEXT CHARACTER
0143  17442 106700  TI.4   CLC TTY
0144  17443 127426        JMP TTY.I,I    RECORD COMPLETE RETURN
0145*
0146  17444 160000  IMODE OCT 160000     LIST ONLY (INPUT=ASR 35)
```

```
0148*
0149********** BASIC SYSTEM TELETYPE OUTPUT DRIVER **********
0150*
0151*    OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0152*    PUNCH, OR BOTH.
0153*
0154*    CALL:  JSB 102B,I
0155*
0156*           (A) = NUMBER OF CHARACTERS TO BE OUTPUT
0157*           (B) = STARTING ADDRESS OF BUFFER
0158*
0159*
0160*     IF (A) IS >= 0  THEN OUTPUT (A) CHARACTERS
0161*     FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0162*
0163*     IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0164*
0165*     BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0166*
0167*     IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
0168*     IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
0169*
0170*
0171  17445 000000  TTY.P NOP
0172  17446 017636        JSB INIT      INITIALIZE AND SETUP
0173  17447 060000  TP.1   LDA TTY       SAVE TTY INTERRUPT
0174  17450 073517        STA TEMPI       INSTRUCTION
0175  17451 060127        LDA LISTR
0176  17452 050126        CPA PLSTR     PLIST?
0177  17453 063515        LDA PMODE     YES
0178  17454 050130        CPA TLSTR     LIST?
0179  17455 063516        LDA LMODE    YES
0180  17456 102600        OTA TTY       SET TTY TO OUTPUT MODE
0181  17457 074000  TP.2   STB TTY       PUT NOP INTO INTERRUPT CELL
0182  17460 017622  TP.3   JSB GETCH     GET NEXT CHARACTER
0183  17461 027502        JMP TP.8      BUFFER EMPTY
0184  17462 102600  TP.4   OTA TTY       LOAD TTY BOARD BUFFER
0185  17463 103700        STC TTY,C     GIVE PRINT COMMAND
0186  17464 102300  TP.5   SFS TTY       WAIT FOR
0187  17465 027464        JMP *-1         FLAG
0188  17466 063517        LDA TEMPI
0189  17467 002003        SZA,RSS       IS INTERRUPT ENABLED?
0190  17470 027460        JMP TP.3      NO
0191*
0192*  THIS SECTION CHECKS IF A CHARACTER HAS BEEN TYPED FROM THE
0193*   KEYBOARD DURING OUTPUT ON TELETYPE.
0194*
0195  17471 102500  TP.6   LIA TTY       LOAD FROM BOARD BUFFER
0196  17472 003000        CMA           FIRST 8 BITS SHOULD BE 1'S
0197  17473 013666        AND B177
0198  17474 002003        SZA,RSS
0199  17475 027460        JMP TP.3      NO KEY STRUCK, CONTINUE
0200  17476 063671        LDA IORI
0201  17477 073633        STA FINSH+1   RESTORE IOR INSTRUCTION
0202  17500 106700  TP.7   CLC TTY       TURN OFF TTY
0203  17501 114105        JSB I.STP,I   GO TO STOP
```

```
0204   17502 106700  TP.8   CLC TTY        TURN OFF TTY
0205   17503 063517         LDA TEMPI
0206   17504 053536         CPA TT.II      IS INTERRUPT MODE SET?
0207   17505 017527         JSB I.ON       YES, RE-ENABLE KEYBOARD
0208   17506 063671         LDA IORI
0209   17507 073633         STA FINSH+1    RESTORE IOR INSTRUCTION
0210   17510 002141         SEZ,CLE,RSS    RECORD COMPLETE?   CLEAR  E
0211   17511 127445         JMP TTY.P,I    E=0, RECORD OUTPUT COMPLETE
0212   17512 063655         LDA M2         E=1, ADD A RETURN AND LINE FEED
0213   17513 067672         LDB CRLFA      LOAD ADDRESS OF CR AND LF
0214   17514 027446         JMP TTY.P+1    DO CR/LF
0215*
0216   17515 110000  PMODE   OCT 110000    PUNCH ONLY (ASR 35)
0217   17516 120000  LMODE   OCT 120000    LIST ONLY  (ASR 35)
0218*
0219   17517 000000  TEMPI   NOP
0221*
0222*       THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE
0223*
0224   17520 000000  I.OFF   NOP
0225   17521 002400         CLA
0226   17522 070000  TI.5    STA TTY        SET NOP INTO INTERRUPT CELL
0227   17523 106700         CLC TTY        TURN OFF READ MODE
0228   17524 000000  R.OFF   NOP           SET TO CLC RDR IF RDR EXISTS
0229   17525 000000  P.OFF   NOP           SET TO CLC PNCH IF PNCH EXISTS
0230   17526 127520         JMP I.OFF,I    RETURN
0232*
0233*       THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE
0234*
0235   17527 000000  I.ON    NOP
0236   17530 063536         LDA TT.II
0237   17531 070000  TI.6    STA TTY        SET JSB INTO INTERRUPT CELL
0238   17532 063444         LDA IMODE
0239   17533 102600  TI.7    OTA TTY        SET TTY TO INPUT MODE
0240   17534 103700         STC TTY,C      SET TTY TO LOOK FOR INPUT
0241   17535 127527         JMP I.ON,I     RETURN
0242*
0243   17536 114105  TT.II   JSB I.STP,I    INTERRUPT LOCATION CODE
```

```
0245*
0246*  CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0247*
0248*       CALL:    JSB PROCS
0249*                (A) HOLDS CHARACTER
0250*
0251*       RETURN:     P+1 = GET NEXT CHARACTER
0252*                   P+2 = RECORD COMPLETE
0253*
0254   17537 000000  PROCS NOP
0255   17540 013666        AND B177        STRIP BIT 7
0256   17541 002003        SZA,RSS         NULL?
0257   17542 127537        JMP PROCS,I     YES, IGNORE
0258   17543 053656        CPA .2          NO, CONTROL B ?
0259   17544 127537        JMP PROCS,I     YES, IGNORE
0260   17545 053657        CPA .3          NO, CONTROL C ?
0261   17546 127537        JMP PROCS,I     YES, IGNORE
0262   17547 053660        CPA LNFD        NO, LINE FEED?
0263   17550 127537        JMP PROCS,I     YES, IGNORE
0264   17551 053666        CPA B177        NO, RUBOUT?
0265   17552 127537        JMP PROCS,I     YES, IGNORE
0266   17553 053665        CPA AMODE       NO, ALT MODE?
0267   17554 027616        JMP CMPLT-1     YES, CANCEL RECORD
0268   17555 053664        CPA OMODE       NO, OLD ALT MODE?
0269   17556 027616        JMP CMPLT-1     YES, CANCEL RECORD
0270   17557 053662        CPA EMODE       NO, ESCAPE MODE?
0271   17560 027616        JMP CMPLT-1     YES, CANCEL RECORD
0272   17561 053661        CPA CRTN        NO, CARRIAGE RETURN?
0273   17562 027617        JMP CMPLT       YES, COMPLETE RECORD
0274   17563 057676        CPB COUNT       NO, BUFFER OVERFLOW?
0275   17564 007400        CCB             YES, LOOK FOR CARRIAGE RETURN
0276   17565 006020        SSB             LOOKING FOR CARRIAGE RETURN?
0277   17566 127537        JMP PROCS,I     YES, RETURN
0278   17567 053663        CPA LFTAR       NO, LEFT ARROW?
0279   17570 027602        JMP DLETE       YES, DELETE PREVIOUS CHARACTER
0280   17571 006014        SLB,INB         NO, CHECK ODD/EVEN FLAG
0281   17572 027576        JMP PROC2       B0 = 0, EVEN CHARACTER
0282   17573 001727  PROC1 ALF,ALF         B0 = 1, ODD CHARACTER
0283   17574 173675        STA BADDR,I     RECORD HIGH CHARACTER
0284   17575 127537        JMP PROCS,I
0285   17576 133675  PROC2 IOR BADDR,I     PACK TWO CHARACTERS
0286   17577 173675        STA BADDR,I     PUT IN BUFFER
0287   17600 037675        ISZ BADDR       INDEX BUFFER ADDRESS POINTER
0288   17601 127537        JMP PROCS,I
```

```
0290*
0291*  THIS SECTION DELETES PREVIOUS CHARACTER(S)
0292*
0293   17602 006003  DLETE SZB,RSS        IS BUFFER EMPTY?
0294   17603 127537        JMP PROCS,I    YES, RETURN
0295   17604 003400        CCA            NO
0296   17605 044000        ADB 0          DECREMENT CHARACTER COUNT
0297   17606 006011        SLB,RSS        LOW CHARACTER?
0298   17607 127537        JMP PROCS,I    YES
0299   17610 043675        ADA BADDR      NO, DECREMENT
0300   17611 073675        STA BADDR        ADDRESS POINTER
0301   17612 163675        LDA BADDR,I    GET LAST TWO CHARACTERS
0302   17613 001727        ALF,ALF
0303   17614 013666        AND B177       DELETE LAST CHARACTER
0304   17615 027573        JMP PROC1      STORE NEXT-TO-LAST CHARACTER
0305*
0306*  THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0307*
0308   17616 067655        LDB M2         SET DELETE FLAG
0309   17617 060001  CMPLT LDA 1          PUT CHARACTER COUNT IN A
0310   17620 037537        ISZ PROCS
0311   17621 127537        JMP PROCS,I




0313*
0314*  SUBROUTINE  GETCH
0315*
0316*    RETURN TO P+1 ON EMPTY BUFFER
0317*    IF THE BUFFER IS NOT EMPTY, ELSE
0318*    RETURN TO P+2 WITH CHARACTER IN (A).
0319*
0320   17622 000000  GETCH NOP
0321   17623 057676        CPB COUNT
0322   17624 127622        JMP GETCH,I    BUFFER EMPTY, P+1 RETURN
0323   17625 163675        LDA BADDR,I    GET TWO CHARACTERS
0324   17626 006011        SLB,RSS
0325   17627 001727        ALF,ALF        B EVEN, POSITION CHARACTER RIGHT
0326   17630 006014        SLB,INB        CHECK O/E, AND INDEX COUNT
0327   17631 037675        ISZ BADDR      B ODD, INCREMENT ADDRESS POINTER
0328   17632 013666  FINSH AND B177       STRIP LEFT CHARACTER
0329   17633 033667        IOR B200       ADD BIT 7
0330   17634 037622        ISZ GETCH
0331   17635 127622        JMP GETCH,I    RETURN TO P+2
```

```
0333*
0334*  INITIALIZES FOR OUTPUTTING A RECORD
0335*
0336   17636 000000  INIT  NOP
0337   17637 002320        CCE,SSA          SET E=1, CHECK FOR (A) < 0
0338   17640 003104        CMA,CLE,INA      SET (E) = 0, (A) = -(A)
0339   17641 073676        STA COUNT        SAVE CHARACTER COUNT
0340   17642 077675        STB BADDR        SET BUFFER STARTING ADDRESS
0341   17643 002002        SZA
0342   17644 006002        SZB              LEADER/TRAILER ONLY?
0343   17645 027651        JMP *+4          NO
0344   17646 063670        LDA CLAI         YES, (B) = 0
0345   17647 073633        STA FINSH+1      SET CLEAR INSTRUCTION
0346   17650 000040        CLE              SET NO CR/LF
0347   17651 006400        CLB              INITIALIZE OUTPUT COUNT
0348   17652 127636        JMP INIT,I
```

```
0350*
0351*  COMMON DRIVER CONSTANTS AND ADDRESSES
0352*
0353  17653 177765  M11    DEC -11
0354  17654 177775  M3     DEC -3
0355  17655 177776  M2     DEC -2
0356  17656 000002  .2     DEC 2
0357  17657 000003  .3     DEC 3
0358  17660 000012  LNFD   OCT 12          LINE FEED
0359  17661 000015  CRTN   OCT 15          CARRIAGE RETURN
0360  17662 000033  EMODE  OCT 33          ESCAPE-CNTRL D
0361  17663 000137  LFTAR  OCT 137         LEFT ARROW CNTRL H
0362  17664 000175  OMODE  OCT 175         OBSOLETE ALT MODE
0363  17665 000176  AMODE  OCT 176         ALT MODE
0364  17666 000177  B177   OCT 177         RUBOUT
0365  17667 000200  B200   OCT 200
0366  17670 002400  CLAI   CLA
0367  17671 033667  IORI   IOR B200        ADD IN BIT 7
0368*
0369  17672 017673  CRLFA  DEF CRLF
0370  17673 106612  CRLF   OCT 106612
0371*
0372  17674 000000  BUFSA  NOP             INITIAL BUFFER ADDRESS
0373  17675 000000  BADDR  NOP             CURRENT BUFFER ADDRESS
0374  17676 000000  COUNT  NOP             HOLDS RECORD LENGTH
0375  17677 000000  EOTC   NOP             END-OF-TAPE COUNTER
0376*
0377*  BASE PAGE REFERENCE ENTRIES
0378*
0379  00101                ORG 101B
0380  00101 100105         DEF I.STP,I     READER LINK INITIALIZED TO STOP
0381  00102 017445         DEF TTY.P       TTY OUTPUT ENTRY ADDRESS
0382  00103 100102         DEF 102B,I      PUNCH LINK INITIALIZED TO TTY
0383  00104 017426         DEF TTY.I       TTY INPUT ENTRY ADDRESS
0384  00105 000000  I.STP  NOP             LINK TO STOP ROUTINE
0385  00106 000000  LWBM   NOP             LAST WORD OF USER SPACE
0386  00107 000000         NOP
0387  00110 000135  FWAM   DEF 135B        FIRST WORD OF AVAILABLE MEMORY
0388  00111 017425  LWAM   DEF TTY.I-1     LAST WORD OF AVAILABLE MEMORY
0389*
0390  00123                ORG 123B
0391  00123 017520  IMOFF  DEF I.OFF       DISABLE KEYBOARD INTERRUPT
0392  00124 017527  IMON   DEF I.ON        SET KEYBOARD INTERRUPT
0393  00125 017424  TLINK  DEF I.TTY+2000B     TTY INPUT INTERRUPT LINK
0394  00126 100103  PLSTR  DEF 103B,I      PLIST OUTPUT ADDRESS
0395  00127 100102  LISTR  DEF 102B,I      LIST DEVICE LINK
0396  00130 100102  TLSTR  DEF 102B,I      LIST OUTPUT ADDRESS
0397*
0398  00117          SYMTA  EQU 117B
0399  00131          IOBFA  EQU 131B        BUFFER ADDRESS
0400  00134          SBUFA  EQU 134B        SYNTAX BUFFER ADDRESS
0401  00000          RDR    EQU 0
0402  00000          PNCH   EQU 0
0403  00000          TTY    EQU 0
0404  00001          TTYI   EQU TTY+1
```

```
0002*
0003*  MODIFY PBS FOR SERIAL TELETYPE
0004*
0005  15073                ORG 15073B
0006*
0007  15073 063653  SRIAL LDA SM11       SET
0008  15074 067302        LDB LST5A       TTY PUNCH
0009  15075 117257        JSB SETIA,I       ADDRESSES
0010  15076 137260        ISZ IOADA,I   INCREMENT SELECT CODE
0011  15077 063262        LDA SM5       SET
0012  15100 067310        LDB LST6A       TTY READER
0013  15101 117257        JSB SETIA,I       ADDRESSES
0014  15102 063263        LDA TT.IS     SET INTERRUPT
0015  15103 070001  TI6   STA TTYI        CELL
0016*
0017  15104 063241        LDA TTYPI     SET OUTPUT
0018  15105 173221        STA COR1A,I
0019  15106 173223        STA COR3A,I     TELETYPE CALLS
0020  15107 173224        STA DMP1A,I
0021  15110 173226        STA GETAA,I       TO SERIAL
0022  15111 173230        STA GET2A,I
0023  15112 173231        STA CRL1A,I         DRIVER
0024*
0025  15113 063243        LDA STF0      SET INPUT
0026  15114 173222        STA COR2A,I
0027  15115 173227        STA GET1A,I     TELETYPE CALLS
0028  15116 037222        ISZ COR2A
0029  15117 037227        ISZ GET1A         TO SERIAL
0030  15120 063242        LDA TTYII
0031  15121 173222        STA COR2A,I         DRIVER
0032  15122 173227        STA GET1A,I
0033  15123 037222        ISZ COR2A
0034  15124 037227        ISZ GET1A
0035  15125 063244        LDA CLF0
0036  15126 173222        STA COR2A,I
0037  15127 173227        STA GET1A,I
0038*
0039  15130 002400        CLA           CLEAR
0040  15131 173232        STA TP9A,I
0041  15132 037232        ISZ TP9A        BUFFERED TELETYPE
0042  15133 173232        STA TP9A,I
0043  15134 173233        STA TP10A,I       INSTRUCTIONS
0044  15135 173225        STA DMP2A,I
0045  15136 037225        ISZ DMP2A
0046  15137 173225        STA DMP2A,I
0047*
0048  15140 063245        LDA STOUA     SET FOR POSSIBLE
0049  15141 173234        STA TOUTA,I     TTY PUNCHING
0050*
0051  15142 063316        LDA LST7A     USE READER AND PUNCH
0052  15143 173237        STA PHRLA,I     DRIVERS IN
0053  15144 063324        LDA LST8A         SERIAL TELETYPE
0054  15145 173240        STA PNCLA,I         PACKAGE
```

```
0056   15146 063246          LDA ROFFA      PREPARE TO SET
0057   15147 173217          STA PHR1A,I      INTERRUPT-OFF INSTRUCTIONS
0058   15150 063247          LDA POFFA          IN SERIAL TELETYPE
0059   15151 173220          STA NOR1A,I          PACKAGE
0060*
0061   15152 063250          LDA SLWMT      SET SERIAL
0062   15153 070111          STA LWAM
0063   15154 063251          LDA SLWMR        TELETYPE VALUES
0064   15155 173235          STA LWMRA,I
0065   15156 063252          LDA SLWMP            IN LWAM CONSTANTS
0066   15157 173236          STA LWMPA,I
0067   15160 063253          LDA STTYP
0068   15161 070102          STA 102B
0069   15162 063254          LDA STTYI
0070   15163 070104          STA 104B
0071   15164 063255          LDA SIOFF
0072   15165 070123          STA IMOFF
0073   15166 063256          LDA SION
0074   15167 070124          STA IMON
0075*
0076*  OVERLAY PARALLEL DRIVERS WITH SERIAL DRIVERS
0077*
0078   15170 163264  SRIA1 LDA MOVES,I   MOVE A
0079   15171 173265          STA DESTS,I    WORD
0080   15172 037264          ISZ MOVES      BUMP
0081   15173 037265          ISZ DESTS        POINTERS
0082   15174 037266          ISZ SMCNT      SERIAL DRIVERS MOVED?
0083   15175 027170          JMP SRIA1      NO
0084   15176 127261          JMP PHRDA,I    YES, RETURN TO MAIN SEQUENCE



0086*
0087*  SUBROUTINE (STOUT) TO OUTPUT ONE CHARACTER TO THE
0088*  TELETYPE.  CHARACTER IS IN (A).  (B) IS NOT ALTERED.
0089*
0090   15177 000000  STOUT NOP
0091   15200 073455          STA TCHAR
0092   15201 063653          LDA SM11       SET BIT
0093   15202 073517          STA BCNT         COUNTER
0094   15203 063455          LDA TCHAR
0095   15204 001000          ALS            ADD
0096   15205 033520          IOR B3000        CONTROL BITS
0097   15206 102700  TP7     STC TTY        TURN ON TELETYPE
0098   15207 103600  TP8     OTA TTY,C      OUTPUT BIT
0099   15210 001300          RAR            POSITION NEXT BIT
0100   15211 102300  TP9     SFS TTY        WAIT FOR
0101   15212 027211          JMP *-1          COMPLETION FLAG
0102   15213 037517          ISZ BCNT       DONE?
0103   15214 027207          JMP TP8        NO
0104   15215 106700  TP10    CLC TTY        YES, TURN OFF TELETYPE
0105   15216 127177          JMP STOUT,I
```

```
0107*
0108*  MODIFICATION ADDRESSES
0109*
0110   15217 016345  PHR1A DEF PHRD1
0111   15220 016363  NOR1A DEF NORD1
0112   15221 016405  COR1A DEF CORA1
0113   15222 016410  COR2A DEF CORA2
0114   15223 016445  COR3A DEF CORA3
0115   15224 016543  DMP1A DEF DUMP1
0116   15225 016544  DMP2A DEF DUMP2
0117   15226 016564  GETAA DEF GETAD+1
0118   15227 016567  GET1A DEF GETA1
0119   15230 016601  GET2A DEF GETA2
0120   15231 016636  CRL1A DEF CRLF1
0121   15232 016672  TP9A  DEF TP.9-1
0122   15233 016723  TP10A DEF TP.10
0123   15234 017245  TOUTA DEF PNCHO
0124   15235 017247  LWMRA DEF LWAMR
0125   15236 017250  LWMPA DEF LWAMP
0126   15237 017310  PHRLA DEF LST2A
0127   15240 017317  PNCLA DEF LST3A
0128*
0129*  MODIFICATION INSTRUCTIONS
0130*
0131   15241 017466  TTYPI JSB .TTYP
0132   15242 017404  TTYII JSB .TTYI
0133   15243 102100  STF0  STF 0
0134   15244 103100  CLF0  CLF 0
0135   15245 015177  STOUA DEF STOUT
0136   15246 073524  ROFFA STA .ROFF
0137   15247 073525  POFFA STA .POFF
0138   15250 017403  SLWMT DEF .TTYI-1+2000B   LWAM OPTIONS
0139   15251 017345  SLWMR DEF HSPR-1+2000B      FOR SERIAL
0140   15252 017324  SLWMP DEF SPNCH-1+2000B       TELETYPE
0141   15253 017466  STTYP DEF .TTYP+2000B
0142   15254 017404  STTYI DEF .TTYI+2000B
0143   15255 017521  SIOFF DEF .IOFF+2000B
0144   15256 017531  SION  DEF .ION+2000B
0145*
0146*  COMMUNICATION LINKS
0147*
0148   15257 016640  SETIA DEF SETI
0149   15260 017244  IOADA DEF IOADR
0150   15261 016334  PHRDA DEF PHRDR
0151*
0152*  LOCAL CONSTANTS AND ADDRESSES
0153*
0154   15262 177773  SM5   DEC -5
0155   15263 114125  TT.IS JSB TLINK,I   TTY INTERRUPT INSTRUCTION
0156   15264 015325  MOVES DEF SPNCH
0157   15265 017325  DESTS DEF SPNCH+2000B
0158   15266 177566  SMCNT ABS SPNCH-SPROC
```

```
0160*
0161*  TELETYPE OUTPUT INSTRUCTION LIST
0162*
0163   15267 015476  LIST5 DEF TP2-1
0164   15270 015477        DEF TP2
0165   15271 015501        DEF TP2+2
0166   15272 015505        DEF TP3-1
0167   15273 015506        DEF TP3
0168   15274 015456        DEF TP5
0169   15275 015523        DEF TP6
0170   15276 015206        DEF TP7
0171   15277 015207        DEF TP8
0172   15300 015211        DEF TP9
0173   15301 015215        DEF TP10
0174*
0175   15302 015267  LST5A DEF LIST5
0176*
0177*  TELETYPE INPUT INSTRUCTION LIST
0178*
0179   15303 015426  LIST6 DEF TI2
0180   15304 015437        DEF TI3
0181   15305 015462        DEF TI4
0182   15306 015522        DEF TI5
0183   15307 015103        DEF TI6
0184*
0185   15310 015303  LST6A DEF LIST6
0186*
0187*  PHOTOREADER INSTRUCTION LIST
0188*
0189   15311 017365  LIST7 DEF PR.3+2000B
0190   15312 017371        DEF PR.5+2000B
0191   15313 017373        DEF PR.6+2000B
0192   15314 017400        DEF PR.7+2000B
0193   15315 017307        DEF RO
0194*
0195   15316 015311  LST7A DEF LIST7
0196*
0197*  HIGH-SPEED PUNCH INSTRUCTION LIST
0198*
0199   15317 017331  LIST8 DEF PN.2+2000B
0200   15320 017332        DEF PN.3+2000B
0201   15321 017333        DEF PN.4+2000B
0202   15322 017340        DEF PN.6+2000B
0203   15323 017316        DEF PO
0204*
0205   15324 015317  LST8A DEF LIST8
```

```
0207*
0208********** BASIC SYSTEM HIGH SPEED PUNCH DRIVER **********
0209*
0210*  OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0211*
0212*  CALL:  JSB 1038,I
0213*
0214*         (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0215*         (B) = STARTING ADDRESS OF BUFFER
0216*
0217*
0218*      IF (A) IS >= 0  THEN OUTPUT (A) CHARACTERS
0219*      FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0220*
0221*      IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0222*
0223*      BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0224*
0225*      IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0226*      IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0227*
0228*
0229  15325 000000  SPNCH NOP
0230  15326 017636        JSB SINIT     INITIALIZE FOR PUNCHING
0231  15327 017622  PN.1   JSB SGTCH     GET NEXT CHARACTER FROM BUFFER
0232  15330 027336        JMP PN.5      BUFFER EMPTY
0233  15331 102600  PN.2   OTA PNCH      LOAD PUNCH BUFFER
0234  15332 103700  PN.3   STC PNCH,C    GIVE PUNCH COMMAND
0235  15333 102300  PN.4   SFS PNCH
0236  15334 027333        JMP *-1       WAIT FOR PUNCH READY
0237  15335 027327        JMP PN.1      GET NEXT CHARACTER
0238*
0239  15336 063671  PN.5   LDA SIORI
0240  15337 073633        STA SPNSH+1   RESTORE IOR INSTRUCTION
0241  15340 106700  PN.6   CLC PNCH      TURN OFF PUNCH
0242  15341 002141        SEZ,CLE,RSS   RECORD COMPLETE? CLEAR E
0243  15342 127325        JMP SPNCH,I   E=0, OUTPUT COMPLETE
0244  15343 063655        LDA SM2       E=1, APPEND CR AND LF
0245  15344 067672        LDB SCRLA     LOAD ADDRESS OF CR AND LF
0246  15345 027326        JMP SPNCH+1   DO CR/LF
```

```
0248*
0249********** BASIC SYSTEM PHOTO READER DRIVER  **********
0250*
0251*  INPUTS TAPE RECORDS THROUGH THE PHOTO READER
0252*
0253*  CALL:  JSB 101B,I
0254*
0255*         (A) =  MAXIMUM NUMBER CHARS IN RECORD
0256*         (B) =  BUFFER STARTING ADDRESS
0257*
0258*   ON RETURN  (A)= -1  TOO MANY CHARACTERS IN RECORD
0259*              (A)= -2  END OF TAPE DETECTED
0260*              (A)= -3  NO TAPE OR GATE DOWN
0261*              (A)= NUMBER OF CHARACTERS IN RECORD
0262*
0263*           INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
0264*
0265*           ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0266*           THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0267*
0268*           THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0269*
0270*           AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0271*           CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0272*
0273*       IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
0274*      READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
0275*
0276*
0277  15346 000000  HSPR  NOP
0278  15347 073676        STA SCONT     SAVE LENGTH
0279  15350 077674        STB SBFSA     SAVE BUFFER STARTING ADDRESS
0280  15351 063653  PR.1   LDA SM11
0281  15352 073677        STA SEOTC     INITIALIZE EOT COUNTER
0282  15353 067674        LDB SBFSA
0283  15354 077675        STB SBDDR     INITIALIZE BUFFER POINTER
0284  15355 006400        CLB           INITIALIZE CHARACTER COUNT
0285  15356 006003  PR.2   SZB,RSS      ANY NON-NULL CHARACTERS YET?
0286  15357 002002        SZA           NO, SKIP IF NULL
0287  15360 027365        JMP PR.3
0288  15361 037677        ISZ SEOTC     COUNT NULL
0289  15362 027365        JMP PR.3      NOT 10 NULLS
0290  15363 063655        LDA SM2       SET A TO INDICATE EOT (-2)
0291  15364 027400        JMP PR.7      10 NULLS, TURN OFF READER & EXIT
0292  15365 103700  PR.3   STC RDR,C    REQUEST CHARACTER
0293  15366 002400        CLA           SET DELAY COUNT
0294  15367 002007  PR.4   INA,SZA,RSS  DELAY = 6.4 * 65K = .41 SECONDS
0295  15370 027402        JMP PR.8      (A)=0, NO TAPE OR GATE DOWN
0296  15371 102300  PR.5   SFS RDR
0297  15372 027367        JMP PR.4      NO FLAG, CHECK DELAY COUNT
0298  15373 103500  PR.6   LIA RDR,C    LOAD CHARACTER
0299  15374 017537        JSB SPROC     PROCESS CHARACTER
0300  15375 027356        JMP PR.2      GET NEXT CHARACTER
0301  15376 057655        CPB SM2       RUBOUT IN THIS RECORD?
0302  15377 027351        JMP PR.1      YES, IGNORE RECORD
0303  15400 106700  PR.7   CLC RDR      TURN OFF READER
```

```
0304  15401 127346        JMP HSPR,I
0305*
0306  15402 063654  PR.8   LDA SM3        LOAD 'NO TAPE' STATUS
0307  15403 027400        JMP PR.7
```

```
0309*
0310********************* BASIC SYSTEM TELETYPE INPUT DRIVER *************
0311*
0312*    INPUTS FROM AN ASR 33/35 THROUGH THE
0313*    TELETYPE CONTROL BOARD FROM TAPE OR KEYBOARD.
0314*
0315*     CALL:  JSB 104B,I
0316*
0317*          (A) =  MAXIMUM NUMBER CHARS IN RECORD
0318*          (B) =  BUFFER STARTING ADDRESS
0319*
0320*     RETURN:    (A)= -1  TOO MANY CHARACTERS IN RECORD
0321*                (A)= -2  RECORD DELETED
0322*                (A)= NUMBER OF CHARACTERS IN RECORD
0323*
0324*
0325*              THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.
0326*
0327*              ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0328*              THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0329*
0330*              THE LEFT ARROW(S) ← DELETE THE PREVIOUS CHARACTER(S).
0331*
0332*              AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0333*              CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0334*
0335*
0336  15404 000000  .TTYI NOP
0337  15405 073676        STA SCONT     SAVE LENGTH
0338  15406 077675        STB SBDDR     SAVE BUFFER ADDRESS
0339  15407 006400        CLB           ZERO CHARACTER COUNT
0340  15410 063456        LDA TP5       SET
0341  15411 073434        STA OUTB        ECHO
0342  15412 017457  TI1   JSB TTINT     INITIALIZE FOR INPUT CHARACTER
0343  15413 063454        LDA BITS      WAIT FOR
0344  15414 002002        SZA             CHARACTER
0345  15415 027413        JMP *-2           COMPLETE
0346  15416 063455        LDA TCHAR     PROCESS
0347  15417 017537        JSB SPROC       CHARACTER
0348  15420 027412        JMP TI1       GET NEXT CHARACTER
0349  15421 006400        CLB           CLEAR
0350  15422 077434        STB OUTB        ECHO
0351  15423 127404        JMP .TTYI,I
```

```
0353*
0354*  THIS SECTION PROCESSES EACH BIT AS IT BECOMES AVAILABLE.
0355*  RETURN THROUGH 105B IF THE INTERRUPT MODE FLAG IS SET UPON
0356*  CHARACTER COMPLETION.
0357*
0358  15424 000000  I.TTY NOP
0359  15425 073453        STA ATEMP     SAVE (A)
0360  15426 103501  TI2   LIA TTYI,C    MERGE
0361  15427 033455        IOR TCHAR       NEW BIT
0362  15430 001300        RAR               INTO
0363  15431 073455        STA TCHAR           CHARACTER
0364  15432 001727        ALF,ALF       POSITION BIT
0365  15433 001222        RAL,RAL         FOR ECHO
0366  15434 000000  OUTB  NOP           OUTPUT INSTRUCTION
0367  15435 037454        ISZ BITS      BIT 11?
0368  15436 027451        JMP EXIT      NO
0369  15437 106701  TI3   CLC TTYI      YES
0370  15440 063455        LDA TCHAR     ALIGN
0371  15441 001723        ALF,RAR         COMPLETED
0372  15442 073455        STA TCHAR         CHARACTER
0373  15443 063536        LDA STOPI     STOP FLAG
0374  15444 002003        SZA,RSS         SET?
0375  15445 027451        JMP EXIT      NO
0376  15446 063671        LDA SIORI     YES, RESTORE
0377  15447 073633        STA SFNSH+1     IOR INSTRUCTION
0378  15450 114105        JSB I.STP,I   GO TO STOP
0379  15451 063453  EXIT  LDA ATEMP     RESTORE (A)
0380  15452 127424        JMP I.TTY,I
0381*
0382  15453 000000  ATEMP NOP
0383  15454 000000  BITS  NOP
0384  15455 000000  TCHAR NOP
0385*
0386  15456 102600  TP5   OTA TTY       ECHO BIT INSTRUCTION
0388*
0389*  THIS ROUTINE INITIALIZES THE SERIAL TELETYPE INPUT ROUTINE
0390*  AND SETS TELETYPE TO ACCEPT INPUT.
0391*
0392  15457 000000  TTINT NOP
0393  15460 063653        LDA SM11      SET
0394  15461 073454        STA BITS        BIT COUNTER
0395  15462 103701  TI4   STC TTYI,C    DEMAND INPUT
0396  15463 002400        CLA           ZERO OUT
0397  15464 073455        STA TCHAR       CHARACTER REPOSITORY
0398  15465 127457        JMP TTINT,I
```

```
0400*
0401********** BASIC SYSTEM TELETYPE OUTPUT DRIVER **********
0402*
0403*     OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0404*     PUNCH, OR BOTH.
0405*
0406*     CALL:  JSB 102B,I
0407*
0408*          (A) = NUMBER OF CHARACTERS TO BE OUTPUT
0409*          (B) = STARTING ADDRESS OF BUFFER
0410*
0411*
0412*      IF (A) IS >= 0  THEN OUTPUT (A) CHARACTERS
0413*      FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0414*
0415*      IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0416*
0417*      BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0418*
0419*      IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
0420*      IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
0421*
0422*
0423  15466 000000  .TTYP NOP
0424  15467 017636        JSB SINIT      INITIALIZE FOR OUTPUT
0425  15470 063653  TP1   LDA SM11       SET BIT
0426  15471 073517        STA BCNT         COUNTER
0427  15472 017622        JSB $GTCH      FETCH NEXT CHARACTER FROM BUFFER
0428  15473 027510        JMP TP4        BUFFER EMPTY
0429  15474 001000        ALS            ADD BIT 7 AND
0430  15475 033520        IOR B3000        CONTROL BITS
0431  15476 102700        STC TTY        REQUEST PRINT
0432  15477 103600  TP2   OTA TTY,C      OUTPUT BIT
0433  15500 001300        RAR            POSITION NEXT BIT
0434  15501 102300        SFS TTY        WAIT FOR
0435  15502 027501        JMP *-1          BIT OUT FLAG
0436  15503 037517        ISZ BCNT       CHARACTER OUT?
0437  15504 027477        JMP TP2        NO
0438  15505 106700        CLC TTY        YES, TURN OFF TTY
0439  15506 102100  TP3   STF TTY        SET FLAG BUFFER (RESETS TIMER)
0440  15507 027470        JMP TP1
0441*
0442  15510 063671  TP4   LDA SIORI      RESTORE IOR
0443  15511 073633        STA SFNSH+1      INSTRUCTION
0444  15512 002141        SEZ,CLE,RSS    DONE?
0445  15513 127466        JMP .TTYP,I    YES
0446  15514 063655        LDA SM2        NO
0447  15515 067672        LDB SCRLA      DO CR/LF
0448  15516 027467        JMP .TTYP+1
0449*
0450  15517 000000  BCNT  NOP
0451  15520 003000  B3000 OCT 3000
```

```
0453*
0454*       THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE
0455*
0456   15521 000000  .IOFF NOP
0457   15522 106701  TI5   CLC TTYI       TURN OFF KEYBOARD
0458   15523 106700  TP6   CLC TTY        TURN OFF PRINTER
0459   15524 000000  .ROFF NOP            SET TO CLC RDR IF READER EXISTS
0460   15525 000000  .POFF NOP            SET TO CLC PNCH IF PUNCH EXISTS
0461   15526 002400        CLA            CLEAR
0462   15527 073536        STA STOPI        STOP FLAG
0463   15530 127521        JMP .IOFF,I



0465*
0466*       THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE
0467*
0468   15531 000000  .ION  NOP
0469   15532 003400        CCA            SET STOP FLAG
0470   15533 073536        STA STOPI        FOR INTERRUPTS
0471   15534 017457        JSB TTINT      ENABLE KEYBOARD
0472   15535 127531        JMP .ION,I
0473*
0474   15536 000000  STOPI NOP            STOP FLAG (INITIALIZED OFF)
```

```
0476*
0477*  CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0478*
0479*       CALL:    JSB PROCS
0480*                (A) HOLDS CHARACTER
0481*
0482*       RETURN:    P+1 = GET NEXT CHARACTER
0483*                  P+2 = RECORD COMPLETE
0484*
0485   15537 000000  SPROC NOP
0486   15540 013666        AND SB177      STRIP BIT 7
0487   15541 002003        SZA,RSS        NULL?
0488   15542 127537        JMP SPROC,I    YES, IGNORE
0489   15543 053656        CPA S.2        NO, CONTROL B?
0490   15544 127537        JMP SPROC,I    YES, IGNORE
0491   15545 053657        CPA S.3        NO, CONTROL C?
0492   15546 127537        JMP SPROC,I    YES, IGNORE
0493   15547 053660        CPA SLNFD      NO, LINE FEED?
0494   15550 127537        JMP SPROC,I    YES, IGNORE
0495   15551 053666        CPA SB177      NO, RUBOUT?
0496   15552 127537        JMP SPROC,I    YES, IGNORE
0497   15553 053665        CPA SAMDE      NO, ALT MODE?
0498   15554 027616        JMP SCMPL-1    YES, CANCEL RECORD
0499   15555 053664        CPA SOMDE      NO, OLD ALT MODE?
0500   15556 027616        JMP SCMPL-1    YES, CANCEL RECORD
0501   15557 053662        CPA SEMDE      NO, ESCAPE MODE?
0502   15560 027616        JMP SCMPL-1    YES, CANCEL RECORD
0503   15561 053661        CPA SCRTN      NO, CARRIAGE RETURN?
0504   15562 027617        JMP SCMPL      YES, COMPLETE RECORD
0505   15563 057676        CPB SCONT      NO, BUFFER OVERFLOW?
0506   15564 007400        CCB            YES, LOOK FOR CARRIAGE RETURN
0507   15565 006020        SSB            LOOKING FOR CARRIAGE RETURN?
0508   15566 127537        JMP SPROC,I    YES, RETURN
0509   15567 053663        CPA SLFTA      NO, LEFT ARROW?
0510   15570 027602        JMP SDLTE      YES, DELETE PREVIOUS CHARACTER
0511   15571 006014        SLB,INB        NO, CHECK ODD/EVEN FLAG
0512   15572 027576        JMP SPR02      B0 = 0, EVEN CHARACTER
0513   15573 001727  SPR01 ALF,ALF        B0 = 1, ODD CHARACTER
0514   15574 173675        STA SBDDR,I    RECORD HIGH CHARACTER
0515   15575 127537        JMP SPROC,I
0516   15576 133675  SPR02 IOR SBDDR,I    PACK TWO CHARACTERS
0517   15577 173675        STA SBDDR,I    PUT IN BUFFER
0518   15600 037675        ISZ SBDDR      INDEX BUFFER ADDRESS POINTER
0519   15601 127537        JMP SPROC,I
```

```
0521*
0522*  THIS SECTION DELETES PREVIOUS CHARACTER(S)
0523*
0524   15602 006003  SDLTE SZB,RSS        IS BUFFER EMPTY?
0525   15603 127537        JMP SPROC,I    YES, RETURN
0526   15604 003400        CCA            NO
0527   15605 044000        ADB 0          DECREMENT CHARACTER COUNT
0528   15606 006011        SLB,RSS        LOW CHARACTER?
0529   15607 127537        JMP SPROC,I    YES
0530   15610 043675        ADA SBDDR      NO, DECREMENT
0531   15611 073675        STA SBDDR        ADDRESS POINTER
0532   15612 163675        LDA SBDDR,I    GET LAST TWO CHARACTERS
0533   15613 001727        ALF,ALF
0534   15614 013666        AND SB177      DELETE LAST CHARACTER
0535   15615 027573        JMP SPRO1      STORE NEXT-TO-LAST CHARACTER
0536*
0537*  THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2
0538*
0539   15616 067655        LDB SM2        SET DELETE STATUS
0540   15617 060001  SCMPL LDA 1          PUT CHARACTER COUNT INTO (A)
0541   15620 037537        ISZ SPROC
0542   15621 127537        JMP SPROC,I




0544*
0545*  SUBROUTINE  GETCH
0546*
0547*    RETURN TO P+1 ON EMPTY BUFFER
0548*    IF THE BUFFER IS NOT EMPTY, ELSE
0549*    RETURN TO P+2 WITH CHARACTER IN (A).
0550*
0551   15622 000000  SGTCH NOP
0552   15623 057676        CPB SCONT
0553   15624 127622        JMP SGTCH,I    BUFFER EMPTY, P+1 RETURN
0554   15625 163675        LDA SBDDR,I    GET TWO CHARACTERS
0555   15626 006011        SLB,RSS
0556   15627 001727        ALF,ALF        B EVEN, POSITION CHARACTER RIGHT
0557   15630 006014        SLB,INB        CHECK O/E, AND INDEX COUNT
0558   15631 037675        ISZ SBDDR      B ODD, INCREMENT ADDRESS POINTER
0559   15632 013666  SFNSH AND SB177      STRIP LEFT CHARACTER
0560   15633 033667        IOR SB200      ADD BIT 7
0561   15634 037622        ISZ SGTCH
0562   15635 127622        JMP SGTCH,I    RETURN TO P+2
```

```
0564*
0565*  INITIALIZES FOR OUTPUTTING A RECORD
0566*
0567   15636 000000  SINIT NOP
0568   15637 002320        CCE,SSA         SET E=1, CHECK FOR (A) < 0
0569   15640 003104        CMA,CLE,INA     SET (E) = 0, (A) = -(A)
0570   15641 073676        STA SCONT       SAVE CHARACTER COUNT
0571   15642 077675        STB SBDDR       SAVE BUFFER STARTING ADDRESS
0572   15643 002002        SZA
0573   15644 006002        SZB             LEADER/TRAILER ONLY?
0574   15645 027651        JMP *+4         NO
0575   15646 063670        LDA SCLAI       YES, (B) = 0
0576   15647 073633        STA SFNSH+1     SET CLEAR INSTRUCTION
0577   15650 000040        CLE             SET NO CR/LF
0578   15651 006400        CLB             INITIALIZE OUTPUT COUNT
0579   15652 127636        JMP SINIT,I
```

```
0581*
0582*  COMMON DRIVER CONSTANTS AND ADDRESSES
0583*
0584   15653 177765   SM11   DEC -11
0585   15654 177775   SM3    DEC -3
0586   15655 177776   SM2    DEC -2
0587   15656 000002   S.2    DEC 2
0588   15657 000003   S.3    DEC 3
0589   15660 000012   SLNFD  OCT 12          LINE FEED
0590   15661 000015   SCRTN  OCT 15          CARRIAGE RETURN
0591   15662 000033   SEMDE  OCT 33          ESCAPE
0592   15663 000137   SLFTA  OCT 137         LEFT ARROW
0593   15664 000175   SOMDE  OCT 175         OBSOLETE ALT MODE
0594   15665 000176   SAMDE  OCT 176         ALT MODE
0595   15666 000177   SB177  OCT 177         RUBOUT
0596   15667 000200   SB200  OCT 200
0597   15670 002400   SCLAI  CLA
0598   15671 033667   SIORI  IOR SB200       ADD IN BIT 7
0599*
0600   15672 015673   SCRLA  DEF SCRLF
0601   15673 106612   SCRLF  OCT 106612
0602*
0603   15674 000000   SBFSA  NOP             INITIAL BUFFER ADDRESS
0604   15675 000000   SBDDR  NOP             CURRENT BUFFER ADDRESS
0605   15676 000000   SCONT  NOP             HOLDS RECORD LENGTH
0606   15677 000000   SEOTC  NOP             END-OF-TAPE COUNTER
0607*
0608                         END
**  NO ERRORS*
```

```
**ORG   ******** 00003/01 00045/01 00379/02 00390/02 00005/03

.135    00544/01 00235/01

.2      00356/02 00271/01 00446/01 00258/02

.20     00541/01 00121/01 00264/01 00275/01

.200    00526/01 00395/01

.3      00357/02 00260/02

.30     00542/01 00221/01

.4      00540/01 00230/01

.HSPR   00072/02 00575/01 00099/02

.IOFF   00456/03 00143/03 00463/03

.ION    00468/03 00144/03 00472/03

.PNCH   00024/02 00576/01 00038/02

.POFF   00460/03 00137/03

.ROFF   00459/03 00136/03

.TTYI   00336/03 00132/03 00138/03 00142/03 00351/03

.TTYP   00423/03 00131/03 00141/03 00445/03 00448/03

AMODE   00363/02 00266/02

ATEMP   00382/03 00359/03 00379/03

B177    00364/02 00310/01 00197/02 00255/02 00264/02 00303/02 00328/02

B200    00365/02 00329/02 00367/02

B3000   00451/03 00096/03 00430/03

B77     00543/01 00050/01

BADDR   00373/02 00339/01 00340/01 00345/01 00078/02 00133/02 00283/02
        00285/02 00286/02 00287/02 00299/02 00300/02 00301/02 00323/02
        00327/02 00340/02

BCNT    00450/03 00093/03 00102/03 00426/03 00436/03

BITS    00383/03 00343/03 00367/03 00394/03

BUF     00493/01 00122/01 00128/01 00265/01 00281/01 00289/01 00444/01
        00445/01 00455/01 00464/01 00466/01 00470/01
```

BUF1 00494/01 00441/01

BUFF 00497/01 00390/01 00404/01 00410/01 00418/01 00421/01

BUFFR 00496/01 00493/01 00494/01

BUFSA 00372/02 00074/02 00077/02

C.03 00539/01 00468/01

C12K 00549/01 00132/01

C16K 00550/01 00135/01

C20K 00551/01 00138/01

C24K 00552/01 00141/01

C28K 00553/01 00144/01

C32K 00554/01 00147/01

C8K 00548/01 00129/01

CHC1 00569/01 00399/01 00412/01

CKSUM 00502/01 00442/01 00453/01 00454/01 00462/01

CLAI 00366/02 00344/02

CLF0 00134/03 00035/03

CM.4 00537/01 00109/01 00417/01

CMPLT 00309/02 00267/02 00269/02 00271/02 00273/02

COPY 00229/01 00219/01 00240/01

COR1A 00112/03 00018/03

COR2A 00113/03 00026/03 00028/03 00031/03 00033/03 00036/03

COR3A 00114/03 00019/03

CORA1 00120/01 00112/03

CORA2 00123/01 00113/03

CORA3 00152/01 00114/03

CORAD 00117/01 00108/01 00153/01

COUNT 00374/02 00338/01 00346/01 00073/02 00132/02 00274/02 00321/02
00339/02

CRL1A 00120/03 00023/03

```
CRLF    00370/02 00369/02

CRLF1   00324/01 00120/03

CRLFA   00369/02 00163/01 00165/01 00040/02 00213/02

CRLFD   00322/01 00070/01 00087/01 00104/01 00117/01 00149/01 00207/01
        00274/01 00278/01 00325/01

CRTN    00359/02 00272/02

DEST    00568/01 00184/01 00198/01 00200/01

DESTS   00157/03 00079/03 00081/03

DLETE   00293/02 00279/02

DMP1A   00115/03 00020/03

DMP2A   00116/03 00044/03 00045/03 00046/03

DUMP    00207/01 00127/01 00130/01

DUMP1   00223/01 00115/03

DUMP2   00225/01 00116/03

EMODE   00360/02 00270/02

EOTC    00375/02 00564/01 00076/02 00083/02

ERRO,   00274/01 00284/01 00286/01 00291/01

EXIT    00379/03 00368/03 00375/03

FINSH   00328/02 00035/02 00201/02 00209/02 00345/02

FWAM    00387/02 00232/01

GET1A   00118/03 00027/03 00029/03 00032/03 00034/03 00037/03

GET2A   00119/03 00022/03

GETA1   00266/01 00118/03

GETA2   00277/01 00119/03

GETAA   00117/03 00021/03

GETAD   00262/01 00073/01 00090/01 00107/01 00270/01 00294/01 00295/01
        00117/03

GETCH   00320/02 00026/02 00182/02 00322/02 00330/02 00331/02

GOMAN   00062/01 00055/01
```

HSPR 00277/03 00139/03 00304/03

I.OFF 00224/02 00230/02 00391/02

I.ON 00235/02 00207/02 00241/02 00392/02

I.STP 00384/02 00203/02 00243/02 00380/02 00378/03

I.TTY 00358/03 00393/02 00380/03

IMODE 00146/02 00135/02 00238/02

IMOFF 00391/02 00185/01 00187/01 00072/03

IMON 00392/02 00188/01 00190/01 00074/03

INCIN 00556/01 00158/01

INIT 00336/02 00025/02 00172/02 00348/02

INPUT 00264/01 00279/01

IOADA 00149/03 00010/03

IOADR 00570/01 00051/01 00288/01 00292/01 00293/01 00343/01 00149/03

IOBFA 00399/02 00210/01

IORI 00367/02 00034/02 00200/02 00208/02

LFTAR 00361/02 00278/02

LIST1 00584/01 00609/01

LIST2 00613/01 00620/01

LIST3 00624/01 00631/01

LIST4 00636/01 00641/01

LIST5 00163/03 00175/03

LIST6 00179/03 00185/03

LIST7 00189/03 00195/03

LIST8 00199/03 00205/03

LISTR 00395/02 00226/01 00175/02

LMODE 00217/02 00179/02

LNFD 00358/02 00262/02

LOOP 00340/01 00347/01

```
LST1A   00609/01 00065/01

LST2A   00620/01 00076/01 00126/03

LST3A   00631/01 00093/01 00127/03

LST4A   00641/01 00110/01

LST5A   00175/03 00008/03

LST6A   00185/03 00012/03

LST7A   00195/03 00051/03

LST8A   00205/03 00053/03

LTG     00485/01 00229/01 00238/01 00488/01

LWAM    00388/02 00081/01 00098/01 00180/01 00183/01 00196/01 00208/01
        00215/01 00234/01 00062/03

LWAMP   00576/01 00097/01 00125/03

LWAMR   00575/01 00080/01 00124/03

LWBM    00386/02 00216/01

LWM     00564/01 00160/01 00162/01 00194/01 00236/01

LWMPA   00125/03 00066/03

LWMRA   00124/03 00064/03

M1      00538/01 00214/01

M11     00353/02 00075/02

M12     00535/01 00118/01

M15     00534/01 00150/01

M2      00355/02 00039/02 00085/02 00096/02 00212/02 00308/02

M20     00533/01 00088/01

M24     00532/01 00064/01

M25     00531/01 00105/01

M27     00530/01 00071/01 00438/01

M3      00354/02 00101/02

M36     00528/01 00209/01
```

```
M377    00545/01 00407/01
M5      00536/01 00075/01 00092/01
M97     00527/01 00212/01
MA1     00507/01 00072/01
MA2     00509/01 00089/01
MA3     00511/01 00222/01
MA4     00513/01 00276/01
MA5     00515/01 00106/01
MA6     00517/01 00119/01
MA7     00519/01 00151/01
MASK    00525/01 00342/01
MOREM   00197/01 00202/01
MOVES   00156/03 00078/03 00080/03
MSG1    00508/01 00507/01
MSG2    00510/01 00509/01
MSG3    00512/01 00511/01
MSG4    00514/01 00513/01
MSG5    00516/01 00515/01
MSG6    00518/01 00517/01
MSG7    00520/01 00519/01
N60     00529/01 00311/01
NBER    00309/01 00283/01 00290/01 00316/01 00317/01
NOR1A   00111/03 00059/03
NORD1   00096/01 00111/03
NORDR   00087/01 00074/01
OMODE   00362/02 00268/02
OUTB    00366/03 00341/03 00350/03
P.OFF   00229/02 00096/01
```

```
P1      00438/01 00476/01

P2      00449/01 00460/01

P3      00462/01 00458/01

PHR1A   00110/03 00057/03

PHRD1   00079/01 00110/03

PHRDA   00150/03 00084/03

PHRDR   00070/01 00150/03

PHRLA   00126/03 00052/03

PLSTR   00394/02 00225/01 00176/02

PMODE   00216/02 00391/01 00177/02

PN.1    00231/03 00237/03

PN.2    00233/03 00199/03

PN.3    00234/03 00200/03

PN.4    00235/03 00201/03

PN.5    00239/03 00232/03

PN.6    00241/03 00202/03

PN1     00025/02 00041/02

PN2     00026/02 00032/02

PN3     00028/02 00624/01

PN4     00029/02 00625/01

PN5     00030/02 00626/01

PN6     00034/02 00027/02

PN7     00036/02 00627/01

PN8     00424/01 00636/01

PNCH    00402/02 00366/01 00367/01 00368/01 00424/01 00630/01 00028/02
        00029/02 00030/02 00036/02 00233/03 00234/03 00235/03 00241/03

PNCHA   00434/01 00233/01 00237/01 00475/01

PNCHI   00573/01 00112/01 00218/01

PNCHO   00572/01 00113/01 00217/01 00408/01 00420/01 00123/03
```

```
PNCLA   00127/03 00054/03

PO      00630/01 00095/01 00628/01 00203/03

POFFA   00137/03 00058/03

POUT    00365/01 00370/01 00573/01 00637/01 00638/01 00639/01

PP02    00404/01 00413/01

PP03    00417/01 00396/01

PR.1    00280/03 00302/03

PR.2    00285/03 00300/03

PR.3    00292/03 00189/03 00287/03 00289/03

PR.4    00294/03 00297/03

PR.5    00296/03 00190/03

PR.6    00298/03 00191/03

PR.7    00303/03 00192/03 00291/03 00307/03

PR.8    00306/03 00295/03

PR1     00075/02 00097/02

PR2     00080/02 00095/02

PR3     00087/02 00613/01 00082/02 00084/02

PR4     00089/02 00092/02

PR5     00091/02 00614/01

PR6     00093/02 00615/01

PR7     00098/02 00616/01 00086/02 00102/02

PR8     00101/02 00090/02

PROC1   00282/02 00304/02

PROC2   00285/02 00281/02

PROCS   00254/02 00094/02 00141/02 00257/02 00259/02 00261/02 00263/02
        00265/02 00277/02 00284/02 00288/02 00294/02 00298/02 00310/02
        00311/02

PUNCH   00389/01 00425/01 00471/01 00487/01

R.OFF   00228/02 00079/01
```

RDR 00401/02 00619/01 00087/02 00091/02 00093/02 00098/02 00292/03
00296/03 00298/03 00303/03

RELOC 00158/01 00133/01 00136/01 00139/01 00142/01 00145/01 00148/01

RO 00619/01 00078/01 00617/01 00193/03

ROFFA 00136/03 00056/03

S.2 00587/03 00489/03

S.3 00588/03 00491/03

SAMDE 00594/03 00497/03

SB177 00595/03 00486/03 00495/03 00534/03 00559/03

SB200 00596/03 00560/03 00598/03

SBDDR 00604/03 00283/03 00338/03 00514/03 00516/03 00517/03 00518/03
00530/03 00531/03 00532/03 00554/03 00558/03 00571/03

SBFSA 00603/03 00279/03 00282/03

SBUFA 00400/02 00213/01

SCLAI 00597/03 00575/03

SCMPL 00540/03 00498/03 00500/03 00502/03 00504/03

SCONT 00605/03 00278/03 00337/03 00505/03 00552/03 00570/03

SCRLA 00600/03 00245/03 00447/03

SCRLF 00601/03 00600/03

SCRTN 00590/03 00503/03

SDLTE 00524/03 00510/03

SEMDE 00591/03 00501/03

SEOTC 00606/03 00281/03 00288/03

SERLA 00565/01 00063/01

SETI 00337/01 00066/01 00077/01 00094/01 00111/01 00348/01 00148/03

SETIA 00148/03 00009/03 00013/03

SFNSH 00559/03 00240/03 00377/03 00443/03 00576/03

SGTCH 00551/03 00231/03 00427/03 00553/03 00561/03 00562/03

SINIT 00567/03 00230/03 00424/03 00579/03

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SIOFF   00143/03 00071/03

SION    00144/03 00073/03

SIORI   00598/03 00239/03 00376/03 00442/03

SLFTA   00592/03 00509/03

SLNFD   00589/03 00493/03

SLWMP   00140/03 00065/03

SLWMR   00139/03 00063/03

SLWMT   00138/03 00061/03

SM11    00584/03 00007/03 00092/03 00280/03 00393/03 00425/03

SM2     00586/03 00244/03 00290/03 00301/03 00446/03 00539/03

SM3     00585/03 00306/03

SM5     00154/03 00011/03

SMCNT   00158/03 00082/03

SOMDE   00593/03 00499/03

SOURC   00567/01 00181/01 00197/01 00199/01

SPNCH   00229/03 00140/03 00156/03 00157/03 00158/03 00243/03 00246/03

SPRO1   00513/03 00535/03

SPRO2   00516/03 00512/03

SPROC   00485/03 00158/03 00299/03 00347/03 00488/03 00490/03 00492/03
        00494/03 00496/03 00508/03 00515/03 00519/03 00525/03 00529/03
        00541/03 00542/03

SRIA1   00078/03 00083/03

SRIAL   00007/03 00565/01

START   00047/01 00035/01 00058/01

STF0    00133/03 00025/03

STOPI   00474/03 00373/03 00462/03 00470/03

STOUA   00135/03 00048/03

STOUT   00090/03 00105/03 00135/03

STTYI   00142/03 00069/03
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STTYP   00141/03 00067/03

SYMTA   00398/02 00211/01

SYSDP   00104/01 00091/01

T1      00498/01 00436/01 00440/01 00449/01 00451/01 00456/01 00473/01

T2      00499/01 00437/01 00457/01 00474/01

T3      00500/01 00439/01 00459/01

T4      00501/01 00447/01 00450/01 00452/01 00463/01

TCHAR   00384/03 00091/03 00094/03 00346/03 00361/03 00363/03 00370/03
        00372/03 00397/03

TEMPI   00219/02 00174/02 00188/02 00205/02

TI.1    00136/02 00584/01

TI.2    00137/02 00585/01 00586/01 00142/02

TI.3    00140/02 00587/01

TI.4    00143/02 00588/01

TI.5    00226/02 00589/01 00590/01

TI.6    00237/02 00591/01

TI.7    00239/02 00592/01 00593/01

TI1     00342/03 00348/03

TI2     00360/03 00179/03

TI3     00369/03 00180/03

TI4     00395/03 00181/03

TI5     00457/03 00182/03

TI6     00015/03 00183/03

TLINK   00393/02 00191/01 00193/01 00155/03

TLSTR   00396/02 00178/02

TOUT    00354/01 00359/01 00572/01

TOUTA   00123/03 00049/03

TP.1    00173/02 00594/01
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TP.10   00423/01 00604/01 00122/03

TP.11   00355/01 00605/01 00606/01 00607/01

TP.2    00181/02 00595/01 00596/01

TP.3    00182/02 00190/02 00199/02

TP.4    00184/02 00597/01 00598/01

TP.5    00186/02 00599/01

TP.6    00195/02 00600/01

TP.7    00202/02 00601/01

TP.8    00204/02 00602/01 00183/02

TP.9    00392/01 00603/01 00121/03

TP1     00425/03 00440/03

TP10    00104/03 00173/03

TP10A   00122/03 00043/03

TP2     00432/03 00163/03 00164/03 00165/03 00437/03

TP3     00439/03 00166/03 00167/03

TP4     00442/03 00428/03

TP5     00386/03 00168/03 00340/03

TP6     00458/03 00169/03

TP7     00097/03 00170/03

TP8     00098/03 00103/03 00171/03

TP9     00100/03 00172/03

TP9A    00121/03 00040/03 00041/03 00042/03

TT.II   00243/02 00206/02 00236/02

TT.IS   00155/03 00014/03

TTINT   00392/03 00342/03 00398/03 00471/03

TTY     00403/02 00355/01 00356/01 00357/01 00392/01 00423/01 00136/02
        00137/02 00138/02 00140/02 00143/02 00173/02 00180/02 00181/02
        00184/02 00185/02 00186/02 00195/02 00202/02 00204/02 00226/02
        00227/02 00237/02 00239/02 00240/02 00404/02 00097/03 00098/03
        00100/03 00104/03 00386/03 00431/03 00432/03 00434/03 00438/03
        00439/03 00458/03
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TTY.I   00131/02 00124/01 00267/01 00144/02 00383/02 00388/02

TTY.P   00171/02 00120/01 00152/01 00223/01 00263/01 00277/01 00324/01
        00211/02 00214/02 00381/02

TTYI    00404/02 00015/03 00360/03 00369/03 00395/03 00457/03

TTYII   00132/03 00030/03

TTYPI   00131/03 00017/03

TWOCH   00281/01 00272/01

UL52    00546/01 00400/01
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